Volume 6

Appendices Continued

XVII Sedimentation Pond Access Road Plans and Written Text

XVIII Haul Road Reclamation Study

DES-BEE-DOVE MINE
C/015/017

VOLUME 6

APPENDIX XVII

Sedimentation Pond Access Road Plans and Written Text

5-8 Sediment Pond Access Road/Plan & Profile (Drawing CS806D - 3 sheets)
5-9 Sediment Pond Access Road Cross-Sections (Drawing CS805E - 2 sheets)

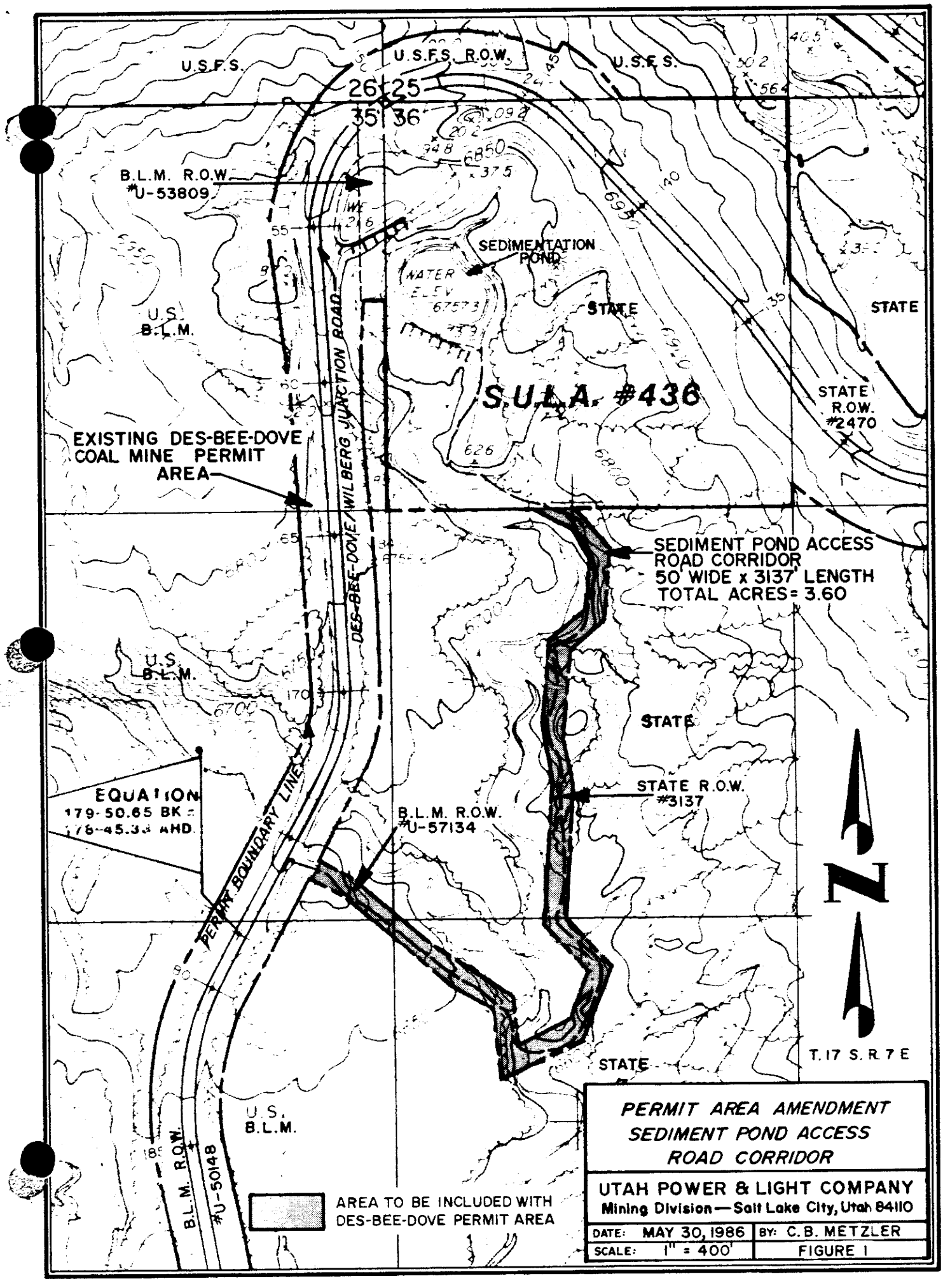
DES-BEE-DOVE COAL MINE
PERMIT #UT-0015, ACT/015/017
PERMIT AMENDMENT - INCIDENTAL BOUNDARY CHANGE TO
INCLUDE THE SEDIMENT POND ACCESS ROAD

Description

In accordance with Mr. Hedberg's letter to UP&L dated March 24, 1986 and as per our meeting with various DOGM personnel on April 11, 1986 it was determined that the Class III Access Road leading from the Des-Bee-Dove junction road to the sediment pond be included in the permit area.

The area of concern consists mainly of an existing access road which is used for annual maintenance operations. The total length of this road is approximately 4,000 feet. Portions of the road are already located within the approved permit area; however, approximately 3,137 feet of the road lies outside of the permit area (see Figure 1). Access road rights of way from both BLM (U57134) and the State of Utah (#3137) have been secured from both agencies with copies of each included with this submittal.

It is planned to include the approximate 3,137 feet of road (as mentioned above) in the Des-Bee-Dove permit area. The area to be permitted will include a 50 foot wide corridor (25 feet on each side of the road centerline) for the length of the unpermitted portion of the road (approximately 3,137 feet) consisting of 3.60 acres falling under the classification of an "Incidental Boundary Change".



PERMIT AREA AMENDMENT
SEDIMENT POND ACCESS
ROAD CORRIDOR

UTAH POWER & LIGHT COMPANY
Mining Division — Salt Lake City, Utah 84110

DATE: MAY 30, 1986	BY: C.B. METZLER
SCALE: 1" = 400'	FIGURE 1

UMC 788.12 - Permit Revision

Determination of this incidental boundary change classification as being a permit amendment was based on the approved rule changes for UMC 700.5, UMC 771.21 (b)(5) and UMC 788.12, January 16, 1986.

Pursuant to regulations governing amendments of permits the following address the specific sections as outlined under UMC 788.12(g).

UMC 771.23 - General Requirements

UMC 782.13 - Identification of Interests

Identification of owners, permit applicant, surface owners, mineral owners, operator and principles, including officers, have been included in the Des-Bee-Dove M.R.P. under legal, financial and compliance section. See Volume 1, Part 1, pages 1-1 thru 1-22. With two exceptions everything remains the same. We have had some changes in personnel (officers) and have assumed primary responsibility as operator effective April 27, 1986.

On-going changes in officers and board members will be updated during mid-term reviews.

UMC 782.15 - Right of Entry

Right of entry has been provided in the form of copies of rights of way secured through BLM and the State of Utah Division of State Lands and Forestry. See Map 5-7 for ownership identification with the road right of way location.

Right of Entry information:

1. Bureau of Land Management - Right of Way Grant #U-57134 issued April 1, 1986.
2. State of Utah Division of State Lands & Forestry - Easement Right of Way #3137 issued April 2, 1986.

UMC 782.16 - Unsuitable for Mining

In consultation with local, state and federal surface management agencies no designated unsuitable mining has taken place within the area of interest. Reference: Des-Bee-Dove M.R.P., Volume 1, Page 1-15.

UMC 782.17 - Permit Term Information

It is requested to include this proposal into the existing and approved Des-Bee-Dove Coal Mine Mining and Reclamation Plan and to coincide with subsequent five-year repermitting approvals.

UMC 782.18 - Personal Injury and Property Damage Insurance

Utah Power & Light Company self assumes the first $2,000,000 of liability coverage.

UMC 782.19 - Other Licenses and Permits

Company has identified all necessary licenses and permits for mining of coal in its Mining and Reclamation Plan. Des-Bee-Dove, Volume 1, Pages 1-18 and 1-18A.

PART UMC 783

ENVIRONMENTAL RESOURCES

UMC 783.11 and .12 - Resource Information

This access road is already existing, therefore, these sections are not applicable.

UMC 783.14 - Description Geology

The existing pond access road is located very close in proximity to the Des-Bee-Dove junction road and, therefore, its geological characteristics are comparably the same. The disturbed area of the existing access road (approximately 1.8 acres) is constructed entirely upon the Masuk Tongue of the Mancos Shale or upon the layer of terrace debris that in places overlies the Mancos Shale. The Masuk Shale consists of gray marine mudstones which form slopes ranging from steep, near the Des-Bee-Dove Mines, to gently sloping pediments in the valley below. The terrace debris is comprised of unconsolidated gravel and boulder wash derived from the erosion of overlying formations.

UMC 783.15 - Hydrology-Ground Water Information

Utah Power & Light Company has put forth a substantial effort in water monitoring, both surface and ground water. Collections have documented water quality and quantity.

Each year tabulated and analytical analyses are provided to the regulatory agencies for further studies affecting lands being mined. Reference, Des-Bee-Dove M.R.P., Volume 1, Pages 2-71 thru 2-98; annual hydrological reports covering the years 1978, 1979, 1980, 1981, 1982, 1983, 1984 and 1985; Office of Surface Mining's Technical Analysis for Des-Bee-Dove Mine Permit Application.

UMC 783.16 - Surface Water Information

Again, Utah Power & Light Company, in conjunction with the Office of Surface Mining, Division of Oil, Gas & Mining, U. S. Forest Service, and private land owners, has, for the past eight years, collected and measured surface waters associated with, and adjacent to, the mining properties known as Des-Bee-Dove Mine.

Drainage areas, including receiving streams are, on a regular basis, sampled and analyzed to determine water quality.

Water collection data is of such volume that raw data sheets are submitted quarterly which includes submitting of the Environmental Protection Agency's National Pollutant Discharge Elimination System reports.

Minimum and maximum flows for springs and streams are reported as stipulated in the permanent permit.

To reference data collection and tabulation see Des-Bee-Dove M.R.P., Volume 1, Pages 2-71 thru 2-98.

UMC 783.17 - Alternate Water Supply Information

Mining has progressed substantially since the submission of the Des-Bee-Dove Coal Mining and Reclamation application submitted on March 20, 1981. Utah Power & Light Company has legally challenged this requirement which, to date, has not been ruled on nor appealed. However, Company has disclosed the mitigation intended in the event diminution occurs. Reference, Des-Bee-Dove M.R.P., Volume 1, Page 2-98.

Use of the access road will not effect surface water or ground water nor its replacement.

UMC 783.18 - Climatological Information

Utah Power & Light Company has agreed to provide the Division periodical submissions of weather data collected from three separate but associated sources.

Reference, Des-Bee-Dove Coal Mine's M.R.P., Volume 1, Pages 2-98 thru 2-101, annual hydrological report 1978 thru 1985.

UMC 783.19 - Vegetation Information

The area of the existing sediment pond access road lies within a mixture of pinyon juniper and salt desert brush vegetational communities. Reference areas of both communities were established in prior years to use as reference for final reclamation. For additional information

refer to Des-Bee-Dove Mine M.R.P., Volume 1, Page 2-102 thru 2-120; also, see Volume 5, Maps 2-12 and 2-13 for vegetational mapping.

UMC 783.20 - Fish and Wildlife Information

A compilation of Utah fish and wildlife resource and habitat information has been provided in the approved Des-Bee-Dove M.R.P. Volume 2, Page 2-133 thru 2-146.

UMC 783.21 - Soils Information

As the mine and its associated disturbances were prior to Public Law 95-87 and subsequent regulations, soil maps and classifications focus mainly on adjacent areas. A soils map depicting soil types and classifications can be found in Des-Bee-Dove M.R.P., Volume 5, Map Packets 2-14 thru 2-16 and descriptions of soil types is described in the soils sections of the M.R.P., Volume 2, Page 2-121 thru 2-132.

UMC 783.22 - Land Use Information

Land use prior to mining was largely grazing and recreation. Portions of this access road were constructed for the power line in this area. Since this road already exists and provides public access to this area it is likely that the land use will remain the same as prior to mining and possibly enhance the area for public use. Reference to

land use is provided in the M.R.P. Volume 2, Pages 2-146 thru 2-149 and Map Packet 2-17.

UMC 783.25 - Cross Sections, Maps and Plan

Included in this submittal and in previous submittals are maps and drawings which show the location of the existing access road to the sediment pond. Refer to M.R.P. Volume 6 and 7 for the location of said maps.

Topographical maps and aerial photographs are submitted to better represent vegetation, drainages and existing facilities.

No mapping of coal, coal workings, outcrop, dips, strikes and overburden are included for reasons that they are not applicable for this submittal.

UMC 783.27 - Prime Farmland Investigation

It has been determined that the permit boundaries of the Des-Bee-Dove Coal Mine does not qualify as "prime farmlands". Reference, Des-Bee-Dove M.R.P., Volume 2, Page 2-149.

PART UMC 784

OPERATION AND RECLAMATION PLAN

UMC 784.11 - Operating Plan

The Des-Bee-Dove pond access road is an existing dirt Class III road which spurs off the Des-Bee-Dove junction road and leads to the mine sedimentation pond. Approximate length of the road is 4,000 feet.

For mining purposes this road is to allow access to the pond for annual maintenance and quarterly inspections (see Map 5-3).

The access road begins at Station 175+50 of the Des-Bee-Dove/Wilberg junction road. The road has been constructed to follow the natural topography to the extent possible. Road width is approximately twelve (12) feet wide. The overall road grade is approximately 2.2 percent with a maximum pitch grade of 16.4 percent for a distance of 100 feet (see Map 5-8).

This plan is submitted in behalf of the unpermitted portion of the access road to be included into the approved Des-Bee-Dove Mine permit area. The unpermitted portion consists of a 50 foot wide corridor along the road (25 feet on each side of the road centerline) from the BLM right of way line on the east side of the junction road to State Lease #436. The approximate length totals 3,137 feet, containing 3.60 acres.

Plans, to upgrade the road to meet Class III standards with drainage improvements were submitted and approved by the Division March 24, 1986. These plans can be referred to in the M.R.P. Volume 7.

UMC 784.12 - Operation Plan: Existing Structures

There are no existing structures associated with the existing access road. Planned drainage control improvements are limited to the existing dirt access road, housed within the proposed 50 foot wide corridor (permit boundary). No modifications or monitoring are needed to comply with 30 CFR, Chapter VII.

UMC 784.13 - Reclamation Plan: General Requirements

The access road will remain in use until final reclamation of the sedimentation pond occurs. Final reclamation of the access road will include removal of concrete drainage controls (cross-mains). The material will be disposed of at an approved disposal site and the natural drainage channels will be reestablished (see Map 5-9).

Because of the limited and dispersed nature of topsoil and vegetation in this area, recontouring of the slopes will be performed in a manner that will minimize additional disturbance. Fill slopes will be restored according to UMC 817.176 (e). Minor cut slopes will be reshaped to blend with the natural contour as required by UMC 817.176 (f).

The major cut slopes located at stations 8+00 to 10+00 and 17+35 will be left in place. These cut slopes are located in areas where similar slopes occur naturally and reduction of the slopes would result in destruction of a significant amount of established vegetation. The road surface will be prepared for seeding through discing and ripping techniques similar to those identified in the MRP for level fills. Shrub planting will not be performed as part of the reclamation of the road corridor area. Invasion by the native shrubs and trees in the area should be sufficient to preclude the necessity for artificial establishment.

Other than as indicated above, final reclamation of the access road will be accomplished in accordance with UMC 817.176 and the currently approved Mining and Reclamation Plan. Cost of final reclamation is estimated at $40,000.00. See Figure 2 for an itemized listing of reclamation costs.

UMC 784.14 - Reclamation Plan - Protection of Hydrological Balance

The reclamation methods outlined above and those mentioned in the Des-Bee-Dove M.R.P. have addressed how protection and control of surface waters will be accomplished in accordance with UMC 817.

DES-BEE-DOVE MINE

SEDIMENTATION POND ACCESS ROAD

RECLAMATION COSTS

Description	Equipment	Hrs	Labor	Hrs	Cost	Construction Days
Remove Drainage Structures, Reestablish Drainage Channels, Recontour Slopes	215 Backhoe Rockbed Truck	120	1 Supervisor 2 Operators	120	$19,770	- 15
Scarify Roadbed	D-8 Dozer	40	1 Supervisor 1 Operator	40	$ 5,825	5
Revegetation (Soil Sampling, Seeding, Fertilizing, Mulching, Placing Netting on Slopes)	Flatbed Truck Tractor Chopper Disc	40	1 Supervisor 3 Operators	64	$ 8,050	8
	Material				$ 5,281	
					$38,926	28

Figure 2

UMC 784.15 - Reclamation Plan - Post Mining Land Use

Post mining land use has been addressed in the Des-Bee-Dove M.R.P., Volume 2, Page 4-26-A thru 4-28. The discing and ripping techniques utilized to prepare the road for seeding should provide equivalent revegetation cover for grazing that existed prior to mining.

Land use after reclamation would primarily be the same as before mining - grazing, wildlife habitat, and recreation.

UMC 784.16 - Reclamation Plan: Ponds, Impoundments, Banks, Dams and Embankments

This road serves as an access route to the Des-Bee-Dove sedimentation pond. The reclamation of the pond has been addressed in the M.R.P. Volume 2, Page 4-5 thru 4-5-B.

UMC 784.17 - Protection of Public Parks and Historical Places

This section is non-applicable to the access road.

UMC 784.18 - Relocation of Use of Public Roads

This section is non-applicable to the access road.

UMC 784.19 - Underground Development Waste

This section is non-applicable to the access road.

UMC 784.20 - Subsidence Control Plan

No mining is associated with this access road; therefore, the subsidence control plan or modification is unnecessary.

UMC 784.21 - Fish and Wildlife Plan

Since the road already exists and the approved planned drainage improvements are considered very minor, there will be very little disturbance that would impact the related environmental values in this area.

UMC 784.22 - Diversions

No diversions or culverts are associated with the access road.

UMC 784.23 - Operation Plan: Maps and Plans

Included in this submittal and in a previous submittal dated February 18, 1986 are detailed plans and drawings sufficient in design and scale to meet minimum requirements of this section.

UMC 784.24 - Transportation Facilities

This section is not applicable.

UMC 784.25 - Abandoned Underground Workings

This section is not applicable.

UMC 784.26 - Air Pollution Control Plan

Periodical use of the access road could add to fugitive dust; however, due to the infrequent use the road fugitive dust amounts are insignificant.

PART UMC 785

SPECIAL CATEGORIES

UMC 785.13 - Experimental Practices Mining

This section is not applicable to the access road.

UMC 785.17 - Prime Farm Lands

It has been determined that within the area of influence no prime farm land exists. Reference, Des-Bee-Dove M.R.P., Volume 2, Page 2-149.

UMC 785.19 - Alluvial Valley Floor Determination

It has been determined that the project area is not classified as determined under this section - an alluvial valley floor.

Reference, Des-Bee-Dove M.R.P., Volume 2, Page 2-150, mining plan decision document TA page 40.

UMC 785.21 - Coal Processing Plants, etc.

This section is not applicable to the access road.

UMC 785.22 - In-Situ Processing Activities

This section is not applicable to the access road.

DES-BEE-DOVE MINE

SEDIMENTATION POND ACCESS ROAD

INTRODUCTION

The Des-Bee-Dove Mine complex, owned by Utah Power and Light Company and operated by Emery Mining Corporation, is located in Northwestern Emery County, approximately seven (7) miles west of Huntington, Utah. The mine is operating under approved Permit ACT/015/017.

The mine portals and surface facilities are located at the head of an unnamed wash on the southeastern perimeter of East Mountain in the Wasatch Plateau. The mine sedimentation pond is located approximately 0.95 miles southeast of the surface facility area.

Annual maintenance operations require access to the sedimentation pond. Access is presently achieved via an existing dirt road, approximately 4,000 feet in length. (See Drawing CM-10602-DS, Sheets 1 and 2, Map Packet 5-3).

The access road begins at Station 175+50 of the Des-Bee-Dove/Wilberg Haul Road. The road has been constructed to follow the natural topography to the extent possible. Road width ranges from approximately twelve (12) feet to approximately thirty-five (35) feet. The overall road grade is approximately 2.2 percent with a maximum pitch grade of 16.4 percent for a distance of 100 feet. (See Drawing CS806D, Sheets 1 thru 3, Map Packet 5-8).

That portion of the access road from the Haul Road right-of-way line to Station 31+52 lies outside the present permit boundary. Therefore, this plan addresses upgrading the road to meet Class III standards.

The access road corridor includes an area twenty-five (25) feet on each side of the centerline of the existing access road as indicated on Drawings CM-10602-DS, Sheets 1 and 2 (Approximately 3.49 acres) (Map Packet 5-3).

PROPOSAL

The access road crosses three significant ephemeral drainages and several smaller channels throughout its length. These locations require upgrading to achieve Class III road standards. The drainage crossing locations and other areas which require drainage improvements are indicated on Drawing CS806D, Sheets 1 thru 3, (Map Packet 5-8.)

Drainage improvements include construction of roadside ditches to collect runoff and concrete cross drains and water bars to convey the runoff across the road. Design of the drainage structures is based on a 10 year - 24 hour precipitation event. Drainage areas are indicated on Drawing CM-10609-DS and supporting calculations are provided in the appendix (Map Packet 5-5)

The three ephemeral drainages are located at stations 16+40, 29+50 and 32+87. In addition to these locations, a fourth, less significant drainage is intersected at station 24+50. The access road also intersects two other drainage channels at stations 11+26 and 13+29. (See Drawing CS805E, Sheets 1 and 2 and Drawing CS806D, Sheets 1 thru 3, (Map Packet 5-8 and 5-9).

A summary of the runoff flows, discharge velocities and drainage structures proposed for these locations is presented in the following table.

TABLE 1

DRAINAGE STRUCTURE SUMMARY

STATION	DRAINAGE AREA #	FLOW (cfs)	CROSS DRAIN DIMENSIONS (ft)*		DISCHARGE VELOCITY (fps)
			(T)	(D)	
11+26	7,18	35.22	8	1.00	9.08
13+29	6,13,14,15,16,17	106.27	16	1.25	10.80
16+40	13	21.07	8	0.75	7.53
24+50	14	6.59	6	0.50	5.40
29+50	15	9.89	8	0.50	5.59
32+87	16	20.80	8	0.75	7.46

*See Drawing GENS804A for typical design,

Road surface drainage will be collected in road side ditches and routed away from the road surface, to cross drain structures and to water bars at stations 22+52 and 27+70 (see Drawing CS806D, Sheets 1 thru 3, and Drawing GENS816A.) The road surface will be sloped toward the side drainage ditch. The roadside ditch, from station 6+00 to the concrete crossdrain at station 11+26, will be lined with graded rip rap to control channel erosion. The down slope area at the cross drain and water bar discharge points will be protected from erosion by rip rap (D_{50}=1 ft minimum). The rip rap protection at station 11+26 will extend across the natural stream to prevent erosion of the stream channel and the stream bank opposite the discharge point.

The primary use of the access road will occur during maintenance and cleaning of the sedimentation pond. Inspection and maintenance of the access road will be conducted in conjunction with the pond inspection and maintenance.

RECLAMATION

The access road will remain in use until final reclamation of the sedimentation pond occurs. Final reclamation of the access road will include removal of the concrete cross drains. The material will be disposed of at an approved disposal site, and the natural drainage channels will be reestablished. (See Drawing CS805E, Sheets 1 and 2, (Map Packet 5-9).

Because of the limited and dispersed nature of topsoil and vegetation in this area, recontouring of the slopes will be performed in a manner that will minimize additional disturbance. Fill slopes will be restored according to UMC 817.176 (e). Minor cut slopes will be reshaped to blend with the natural contour as required by UMC 817.176 (f).

The major cut slopes located at stations 8+00 to 10+00 and 17+35 will be left in place. These cut slopes are located in areas where similar slopes occur naturally and reduction of the slopes would result in destruction of a significant amount of established vegetation. The road surface will be prepared for seeding through discing and ripping techniques similar to those identified

in the MRP for level fills. Shrub planting will not be performed as part of the reclamation of the road corridor area. Invasion by the native shrubs and trees in the area should be sufficient to preclude the necessity for artificial establishment.

Other than as indicated above, final reclamation of the access road will be accomplished in accordance with UMC 817.176 and the currently approved Mining and Reclamation Plan. Cost of final reclamation is estimated at $40,000.00.

APPENDIX

DES-BEE-DOVE SEDIMENTATION POND

ACCESS ROAD HYDROLOGIC CALCULATIONS

Methodology: U.D.O.T Manual of Instruction, Part 4, Road Drainage.
Small Area Runoff Formulas $Q_f = Q_c \times LF \times FF$

Where: Q_f = Design discharge in c.f.s.

Q_c = Discharge Formula $Q_c = \dfrac{(1)\ (K)\ (A)^{.795}}{.15}$

LF = Land Factor

FF = Frequency Factor

A = Area

From Des-Bee-Dove Coal Mine Permit Application
Volume 6, Addition 1-11-85. Des-Bee-Dove/Wilberg Junction Road Hydrologic Calculations For Existing Culverts.

LF = 1.5

FF = 0.82

K Factor = 0.15

Drainage areas taken from Drawing CM-10609-DS.
Areas determined by planimeter.
Drainage structure design is based on a 10 year - 24 hour precipitation event.

AREA #13: 35.64 Acres

$$Q_c = \frac{(1)\ (K)\ (A)^{.795}}{.015}$$

$$= \frac{(1)\ (.15)\ (35.64)^{.795}}{.15}$$

$$= 17.13 \text{ cfs}$$

$$Q_{10} = Q_c \times LF \times FF$$

$$= (17.13)\ (1.5)\ (0.82)$$

$$= 21.07 \text{ cfs}$$

AREA #14: 8.26 Acres

$$Q_c = \frac{(1)\ (.15)\ (8.26)^{.795}}{.15} = 5.36 \text{ cfs}$$

$$Q_{10} = (5.36)\ (1.5)\ (0.82) = 6.59 \text{ cfs}$$

AREA #15: 11.96 Acres

$$Q_c = \frac{(1)\ (.15)\ (11.96)^{.795}}{.15} = 7.19 \text{ cfs}$$

$$Q_{10} = (7.19)\ (1.5)\ (0.82) = 8.85 \text{ cfs}$$

Add 9% of runoff from Area 4. (See MRP)

= 8.85+1.04 = 9.89 cfs

AREA #16: 14.53 Acres

$$Q_c = \frac{(1)\ (.15)\ (14.53)^{.795}}{.15} = 8.39 \text{ cfs}$$

$$Q_{10} = (8.39)\ (1.5)\ (0.82) = 10.33 \text{ cfs}$$

Add 91% of runoff from Area 4. (See MRP)

= 10.33+10.47=20.80cfs

AREA #17: 29.27 Acres

$$Q_c = \frac{(1)\ (.15)\ (29.27)^{.795}}{.15} = 14.65 \text{ cfs}$$

$$Q_{10} = (14.65)\ (1.5)\ (0.82) = 18.02 \text{ cfs}$$

AREA #18: 9.32 Acres

$$Q_c = \frac{(1)\ (.15)\ (9.32)^{.795}}{.15} = 5.90 \text{ cfs}$$

$$Q_{10} = (5.90)\ (1.5)\ (0.82) = 7.25 \text{ cfs}$$

AREA #6: 55.35 Acres, Q_{10} = 29.90 cfs (From MRP)

AREA #7: 50.89 Acres, Q_{10} = 27.97 cfs (From MRP)

FLOWS AT ROAD STATIONS.

STATION 11+26 = Area 7 + Area 18

= 27.97 cfs + 7.25 cfs

Q_{10} = 35.22 cfs

STATION 13+29 = Area 6, 13, 14, 15, 16, 17

= 29.90 + 21.07 + 6.59 + 9.89 + 20.80 + 18.02

Q_{10} = 106.27 cfs

STATION 16+40 = Area 13

Q_{10} = 21.07 cfs

STATION 24+50 = Area 14

Q_{10} = 6.59 cfs

STATION 29+50 = Area 15

Q_{10} = 9.89 cfs

STATION 32+87 = Area 16

Q_{10} = 20.80 cfs

Cross drain sizing is calculated according to procedures found in Applied Hydrology and Sedimentology for Disturbed Areas by B. J. Barfield, R. C. Warner and C.T. Haan, 1981. Pages 158 and 159. A summary of the calculations follows:

Slope = 0.02 (2%)

n = .015 (Mannings n for concrete lined channel, Page 159)

STATION	T(ft)	D(ft)	Q max(cfs)	t(ft)	d(ft)	Q_{10}(cfs)	V(fps)
11+26	8	1	55.52	7.19	0.81	35.22	9.08
13+29	16	1.25	163.94	14.47	1.02	106.27	10.08
16+40	8	0.75	35.02	7.12	0.59	21.07	7.53
24+50	6	0.50	13.43	5.10	0.36	6.59	5.40
29+50	8	0.50	17.91	6.98	0.38	9.89	5.59
32+87	8	0.75	35.02	7.10	0.59	20.80	7.46

If b >> d then the 2d in the denominator can be ignored leaving

$$R \cong \frac{bd}{b} = d$$

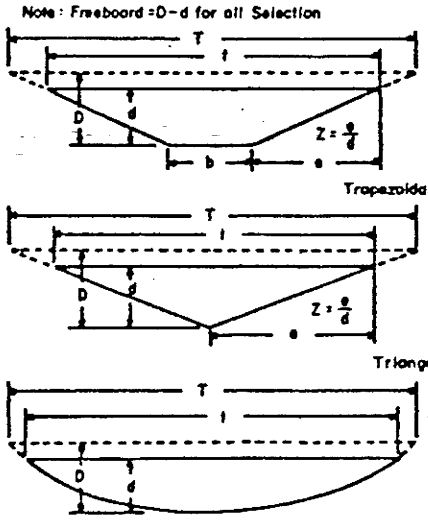
For a parabolic channel

$$R \cong \frac{t^2 d}{1.5\, t^2} = \frac{2}{3} d$$

If t >> d then $4d^2$ in the denominator can be ignored leaving

$$R \cong \frac{t^2 d}{1.5\, t} = \frac{2}{3} d$$

These approximations can serve as initial estimates for d in trial and error solutions that often arise in open channel hydraulics.



Cross-Sectional Area a	Wetted Perimeter, p	Hydraulic Radius R = a/p	Top Width
$bd + Zd^2$	$b + 2d\sqrt{Z^2+1}$	$\frac{bd + Zd^2}{b + 2d\sqrt{Z^2+1}}$	$t = b + 2dZ$ $T = b + 2DZ$
Zd^2	$2d\sqrt{Z^2+1}$	$\frac{Zd}{2\sqrt{Z^2+1}}$ or $\frac{d}{2}$ approx.	$t = 2dZ$ $T = \frac{D}{d} t$
$\frac{2}{3} td$	$t + \frac{8d^2}{3t}$	$\frac{t^2 d}{1.5t^2 + 4d^2}$ or $\frac{2d}{3}$ approx.	$t = \frac{a}{0.67d}$ $T = t\left(\frac{D}{d}\right)^{1/2}$

Figure 3.8. Properties of typical channels.

Table 3.1 Typical Values for Manning's n.

Type and Description of Conduits	n Values* Min.	Design	Max.
Natural Streams			

Type and Description of Conduits	n Values* Min.	Design	Max.
Channels, Lined			

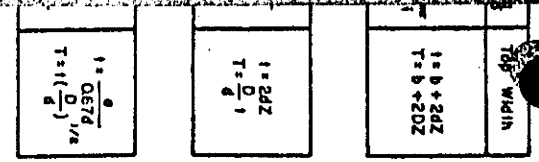


Table 3.1 Typical Values for Manning's n.

Type and Description of Conduits	n Values* Min.	Design	Max.
Channels, Lined			
Asphaltic concrete, machine placed		0.014	
Asphalt, exposed prefabricated		0.015	
Concrete	0.012	0.015	0.018
Concrete, rubble	0.016		0.029
Metal, smooth (flumes)	0.011		0.015
Metal, corrugated	0.021	0.024	0.026
Plastic	0.012		0.014
Shotcrete	0.016		0.017
Wood, planed (flumes)	0.009	0.012	0.016
Wood, unplaned (flumes)	0.011	0.013	0.015
Channels, Earth			
Earth bottom, rubble sides	0.028	0.032	0.035
Drainage ditches, large, no vegetation			
(a) < 2.5 hydraulic radius	0.040		0.045
(b) 2.5-4.0 hydraulic radius	0.035		0.040
(c) 4.0-5.0 hydraulic radius	0.030		0.035
(d) > 5.0 hydraulic radius	0.025		0.030
Small drainage ditches	0.035	0.040	0.040
Stony bed, weeds on bank	0.025	0.035	0.040
Straight and uniform	0.017	0.0225	0.025
Winding, sluggish	0.0225	0.025	0.030
Channels, Vegetated (See subsequent discussion)			

Type and Description of Conduits	n Values* Min.	Design	Max.
Natural Streams			
(a) Clean, straight bank, full stage, no rifts or deep pools	0.025		0.033
(b) Same as (a) but some weeds and stones	0.030		0.040
(c) Winding, some pools and shoals, clean	0.035		0.050
(d) Same as (c), lower stages, more ineffective slopes and sections	0.040		0.055
(e) Same as (c), some weeds and stones	0.033		0.045
(f) Same as (d), stony sections	0.045		0.060
(g) Sluggish river reaches, rather weedy or with very deep pools	0.050		0.080
(h) Very weedy reaches	0.075		0.150
Pipe			
Asbestos cement		0.009	
Cast iron, coated	0.011	0.013	0.014
Cast iron, uncoated	0.012		0.015
Clay or concrete drain tile (4-12 in.)	0.010	0.0108	0.020
Concrete	0.010	0.014	0.017
Metal, corrugated	0.021	0.025	0.0255
Steel, riveted and spiral	0.013	0.016	0.017
Vitrified sewer pipe	0.010	0.014	0.017
Wood stave	0.010	0.013	
Wrought iron, black	0.012		0.015
Wrought iron, galvanized	0.013	0.016	0.017

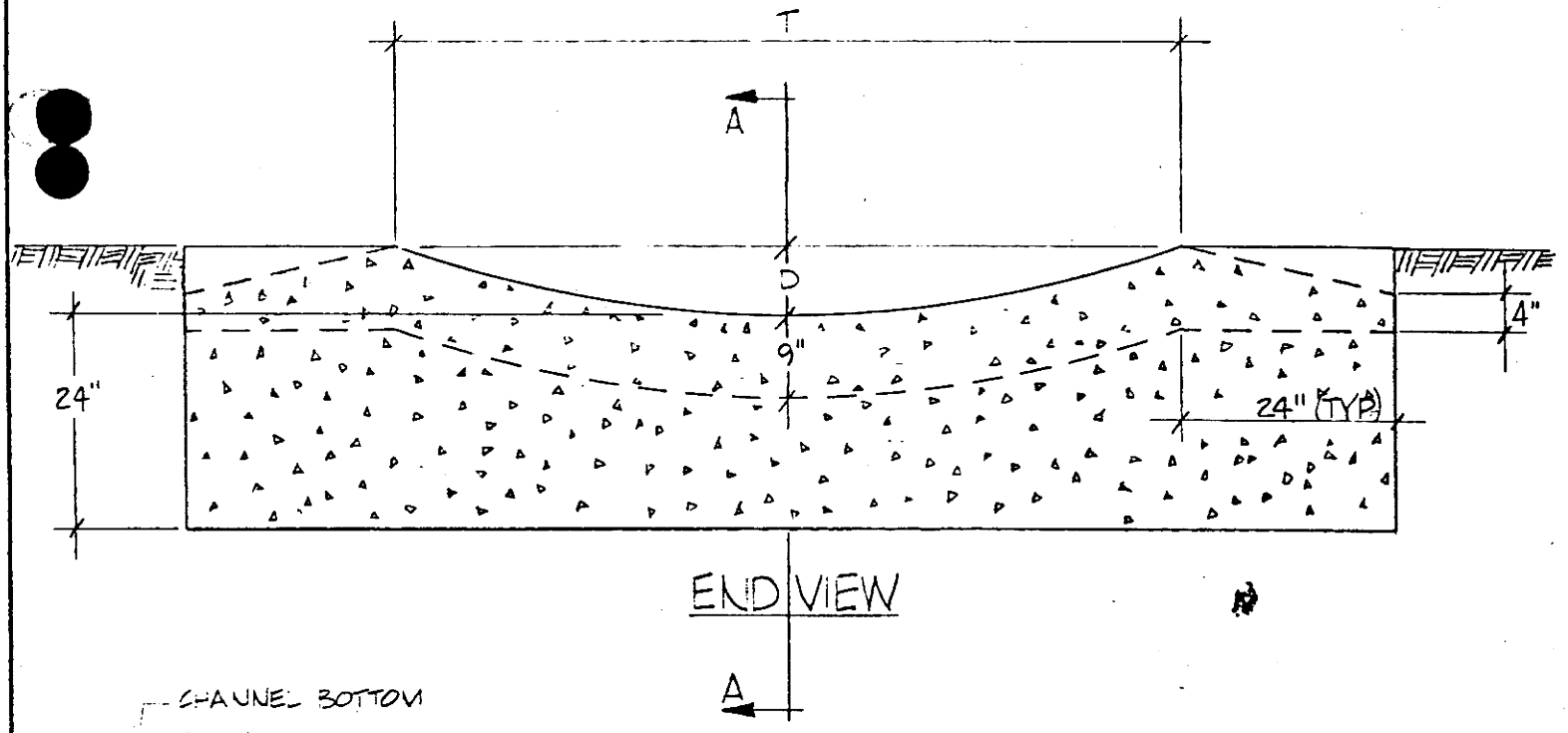
*Selected from numerous sources.

DES BEE DOVE MINE

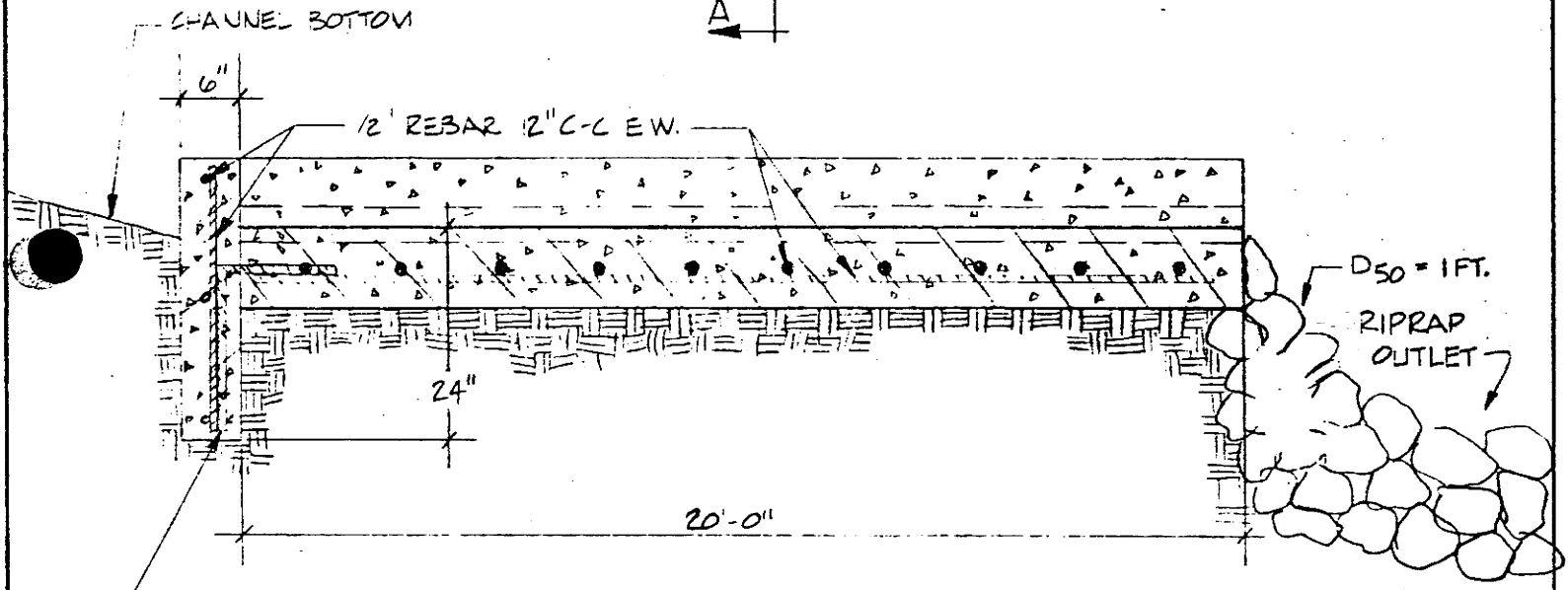
SEDIMENTATION POND ACCESS ROAD

RECLAMATION COSTS

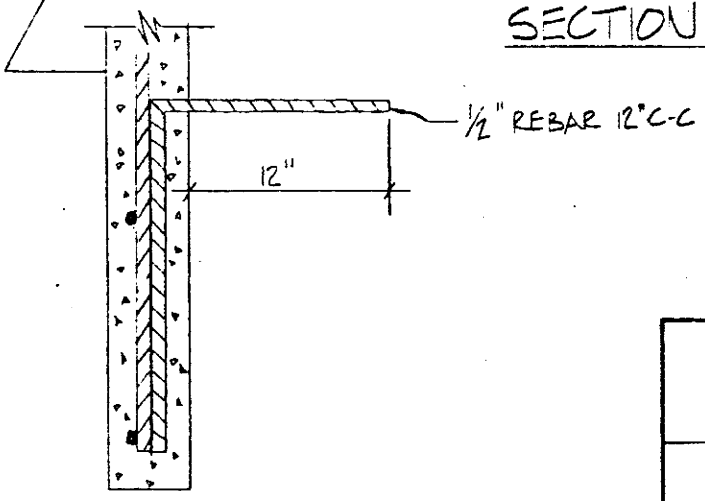
DESCRIPTION	EQUIPMENT	HRS	LABOR	HRS	COST	CONSTRUCTION DAYS
REMOVE DRAINAGE STRUCTURES, REESTABLISH DRAINAGE CHANNELS, RECONTOUR SLOPES	215 BACKHOE ROCKBED TRUCK	120	1 SUPERVISOR 2 OPERATORS	120	$19,770	15
SCARIFY ROADBED	D-8 DOZER	40	1 SUPERVISOR 1 OPERATOR	40	$ 5,825	5
REVEGETATION (SOIL SAMPLING, SEEDING, FERTILIZING, MULCHING, PLACING NETTING ON SLOPES).	FLATBED TRUCK TRACTOR CHOPPER DISC	40	1 SUPERVISOR 3 OPERATORS	64	$ 8,050	8
	MATERIAL				$ 5,281	
					$38,926	28



END VIEW



SECTION A-A



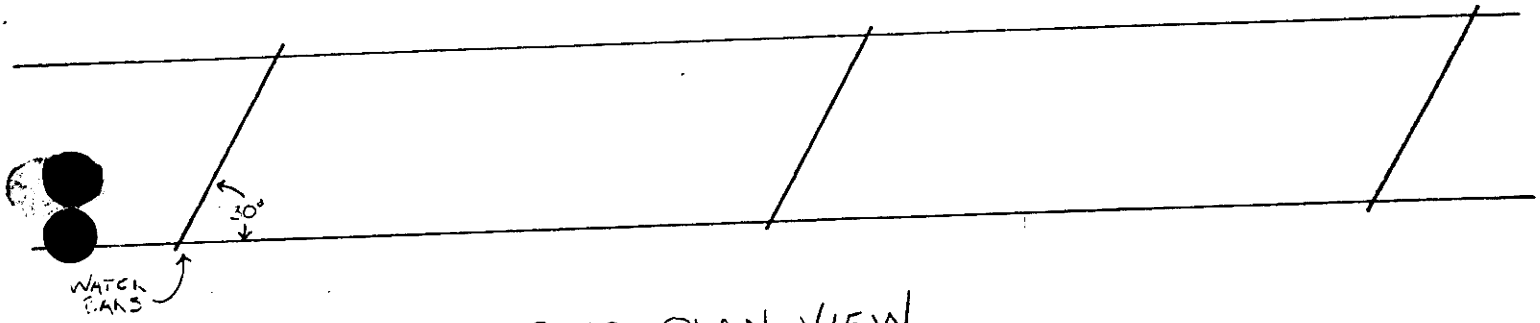
EMERY MINING CORP.

HUNTINGTON, UTAH 84528

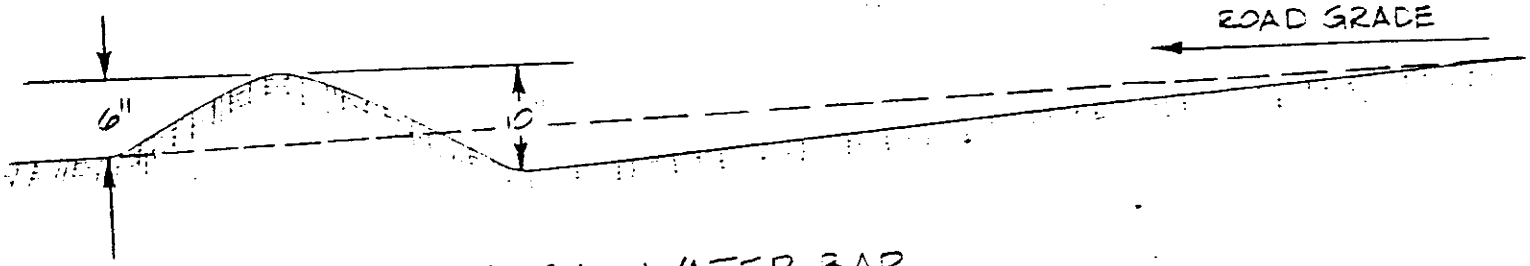
TYPICAL CONCRETE CROSS DRAIN

MARK	REVISIONS	DATE

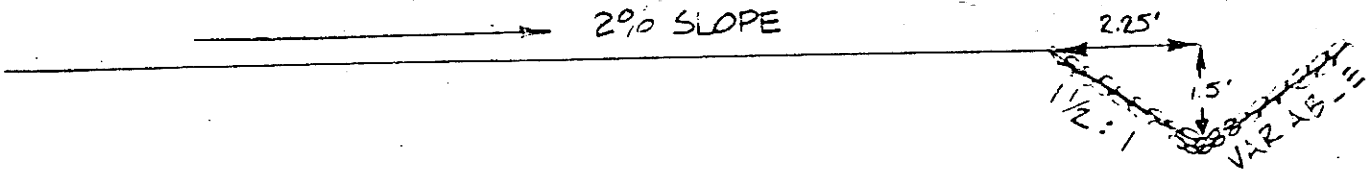
DRAWN BY:	APPROVED BY:	DRAWING NO.
K.J.L.		GENS804A
SCALE: NONE	DATE: 2-10-85	



ROAD PLAN VIEW



TYPICAL WATER BAR
CROSS-SECTION



TYPICAL ROADSIDE DITCH

EMERY MINING CORP.

HUNTINGTON, UTAH 84528

TYPICAL
WATER BAR & ROADSIDE DITCH

MARK	REVISIONS	DATE
1	FOR ALLEN TIPPLE PLAN VIEW	2-11-86

DRAWN BY	APPROVED BY	DRAWING NO
C. J.		GENS862
SCALE NONE	DATE 2-2-86	

DES-BEE-DOVE MINE
C/015/017

VOLUME 6

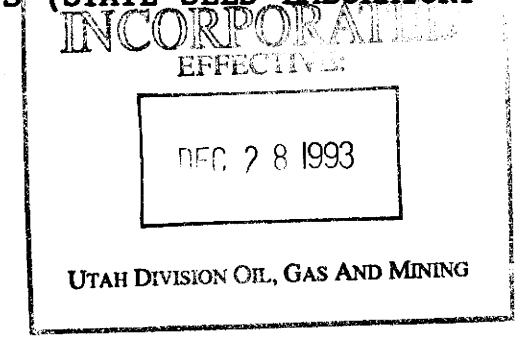
APPENDIX XVIII

Haul Road Reclamation Study

APPENDIX XVI

SUMMARY

1. JULY 25, 1990 LETTER TO MR. DAVID SMALDONE FROM MS. PAMELA GRUBAUGH-LITTIG
2. JULY 12, 1990 MEMO FROM TOM MUNSON TO MS. PAMELA GRUBAUGH-LITTIG
3. TEST PLOTS - OUTLINE
4. JULY 31, 1990 LETTER TO MS. PAMELA GRUBAUGH-LITTIG FROM VAL PAYNE (WITH AERIAL PHOTOS)
5. HAUL ROAD RECLAMATION STUDY
6. DES BEE DOVE EROSION TASK FORCE AGENDA
7. NOVEMBER 13, 1991 MEMO TO TASK FORCE MEMBERS FROM GUY DAVIS
8. DES BEE DOVE HAUL ROAD RECLAMATION STUDY RUNOFF AND SEDIMENT YIELD MONITORING PROGRAM (WITH DRAWING)
9. JUNE 12, 1992 LETTER TO PAMELA GRUBAUGH-LITTIG FROM VAL PAYNE - DES BEE DOVE TEST PLOT PLAN
10. SEPTEMBER 25, 1992 LETTER TO MS. PAMELA GRUBAUGH-LITTIG FROM VAL PAYNE
11. FEBRUARY 4, 1993 LETTER TO MS. PAMELA GRUBAUGH-LITTIG FROM VAL PAYNE
12. MARCH 26, 1993 LETTER TO MS. PAMELA GRUBAUGH-LITTIG FROM VAL PAYNE
13. PURE LIVE SEED (PLS) DETERMINATION - NATIVE SEED
14. PURE SEED TESTING - NATIVE SEED
15. NATIVE SEED GERMINATION TEST REPORTS (STATE SEED LABORATORY #1814 - 1818)
16. NATIVE SEED SOURCE
17. NURSERY SEED SOURCE
18. SOIL ANALYSIS REPORTS (09/30/92)



APPENDIX XVI
REVISED 9/9/93

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

July 25, 1990

CC: T. Fouchaux
M. Moon

Mr. David R. Smaldone, Director
Permitting, Compliance & Services
Utah Power and Light Company
Mining Division
P. O. Box 26128
Salt Lake City, Utah 84126-0128

Dear Mr. Smaldone:

Re: **Review of Des-Bee-Dove Haul Road, Utah Power and Light Company, Des-Bee-Dove Mine, ACT/015/017, Folder #2, Emery County, Utah**

Attached is a Technical Memorandum that reviews the above-referenced reclaimability of the Des-Bee-Dove Haul Road. The operator must commit to a literature search and a study of reclamation options and initiation of test plots for this site.

A time frame for this project and a work outline must be submitted to the Division by August 3, 1990.

Sincerely,

Pamela Grubaugh-Littig

Pamela Grubaugh-Littig
Permit Supervisor

djh
Attachment
cc: V. Payne, UP&L
"A" Team, DOGM
AT

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

July 12, 1990

TO: Pamela Grubaugh-Littig, Permit Supervisor

FROM: Tom Munson, Sr. Reclamation Hydrologist

RE: Haul Road Reclamation Meeting, Des-Bee-Dove Mine, Utah Power and Light Company, ACT/015/017, Folder #2, Emery County, Utah

Synopsis

On July 12, 1990, Val Payne, Utah Power and Light Company's (UP&L) representative, met with Division personnel Susan White, Henry Sauer, Jesse Kelley, Jeff Emmons, and Tom Munson to discuss the reclamation of the Des-Bee-Dove Haul Road and the Initial Completeness Review for the Des-Bee-Dove Mine.

Analysis

The meeting involved a lot of discussion regarding the reclamation of the Haul Road in terms of regrading slopes, future erosion control, revegetation success, and ongoing erosion control test plots.

The Division staff presented the operator with a list of topics and ideas which were intended to help him formulate a reclamation strategy. It was the general consensus of all people involved that we do not have enough technical information at this point in time to make an informed finding regarding reclamation success.

To satisfy questions regarding reclamation options raised in the Initial Completeness Review, and decide what the operator would be required to do. The operator was requested to follow the following review framework.

1. Literature search,
2. Study feasibility of reclamation options and initiate test plots/consultant review.

In addition to a commitment and a time frame for completion of all commitments regarding a reclamation plan, the operator was requested to formulate ideas based on present knowledge of reclamation of Mancos Shale and present them along with the Initial Completeness Review Response.

Based on the complexity of this issue and the lack of knowledge regarding reclamation of Mancos Shale, it was decided that gathering all information available and assessing the feasibility of implementation of new reclamation methods and techniques will be paramount to merely choosing an immediate course of action based on present knowledge.

Recommendations

The operator be required to maintain a strict time frame for review of data, studying feasibility of reclamation options, and implementation of test plots.

Another meeting of all parties concerned be held to better define reclamation strategy and to maintain a diligent and responsible effort to obtain a feasible reclamation plan.

djh
cc: "A" Team
AT46/34-35

utah power
& LIGHT COMPANY
MINING DIVISION
P O Box 310
Huntington, Utah 84528

July 31, 1990

Ms. Pamela Grubaugh-Littig
Permit Supervisor
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

RE: Des Bee Dove Haul Road Reclamation Study, Utah Power and Light Company, Des Bee Dove Mine, ACT/015/017, Folder #2, Emery County, Utah

Dear Ms. Grubaugh-Littig:

Submitted in response to your letter to Mr. Smaldone dated July 25, 1990, please find the proposed schedule for the above referenced project.

PROJECT PHASES/TASKS	COMPLETION DATE
DESIGN	
Literature Review	9/30/90
Identify relevant factors and options	
Grading	
Drainage	
Erosion Control	
Revegetation	
Site/Area Characterization	10/31/90
Site vs literature info	
Topography	
Soils	
Vegetation	
Drainage/Erosion Patterns	
Precipitation	
Design Development	1/5/91
Consultation	
Engineering	
Hydrology/Hydraulics	
Vegetation	
Erosion/Sediment Control	
Monitoring	

Design Review/Modification/Approval 3/15/91
DOGM/OSM
Consultant

10/15/91

IMPLEMENTATION

Materials Procurement
Slope Stabilization
Erosion Control
Revegetation
Seed/Plants
Soil Amendments
Site Preparation
Materials Installation

8/15/95

MONITORING AND EVALUATION

Stability
Erosion
Sediment Production
Precipitation
Vegetation
Soils

The project involves several uncontrollable factors including the schedules of various personnel (including DOGM and OSM), laboratory time, availability of materials and seasonal consideration for implementation. Therefore, I feel the proposed schedule is realistic and reasonable.

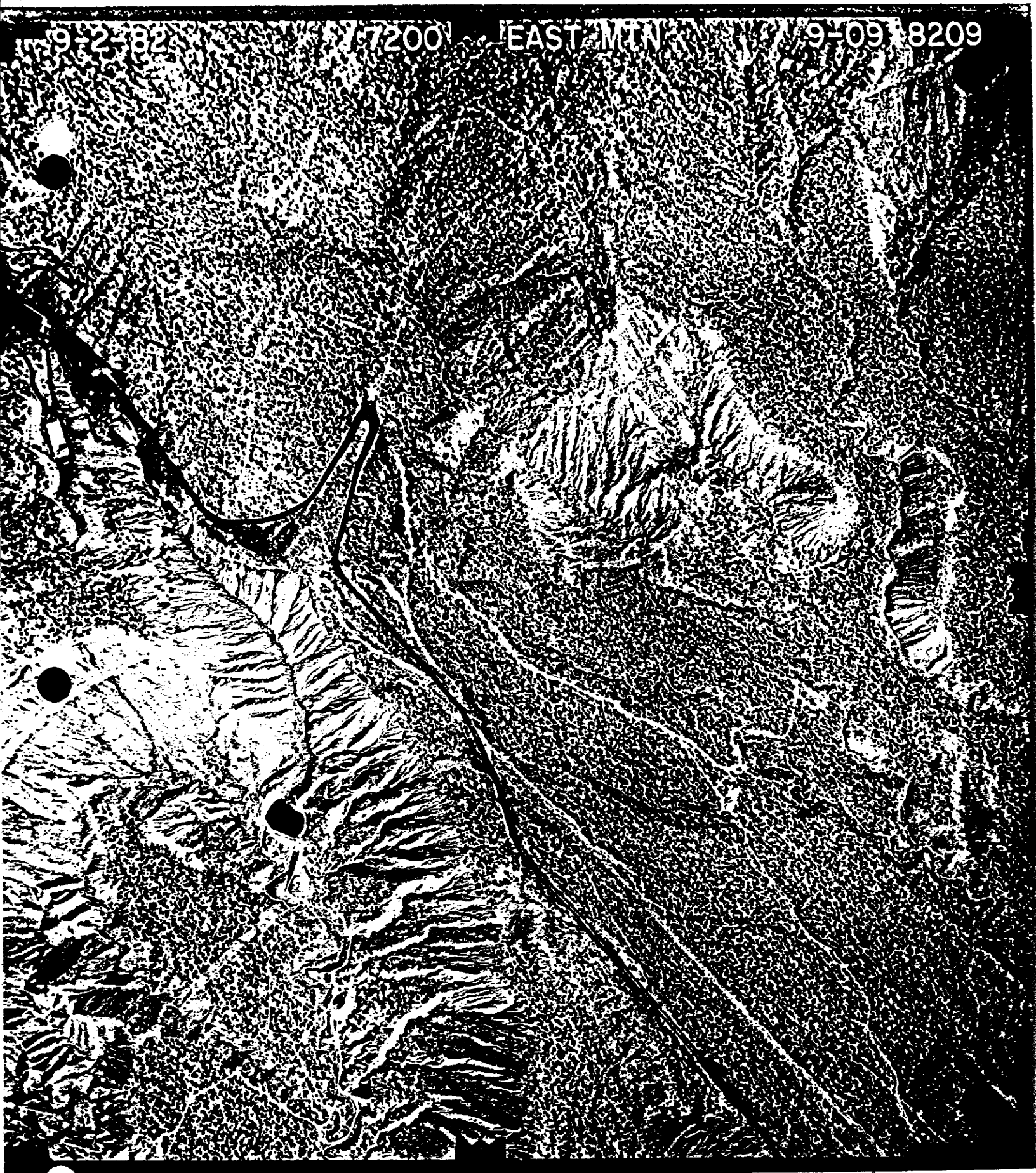
If you have questions or comments regarding this matter, please call me at 687-9821.

Sincerely,

Val Payne
Senior Environmental Engineer

VP/do

cc: D.W. Jense
S. Child
G. Davis
T. Faucheux
M. Moon



EFFECTIVE:

DEC 2 8 1993

UTAH DIVISION OIL, GAS AND MINING

DES BEE DOVE HAUL ROAD
RECLAMATION STUDY

INTRODUCTION

The focus of the Reclamation Study is primarily the Mancos shale. Therefore; the following information, regarding the first three phases of the study, addresses only the portion of the haul road which impacted the Mancos shale. Specifically, the major fill slope located between Stations 131+00 and 142+00.

PHASE I LITERATURE REVIEW/INFORMATION SEARCH

Because the primary issues are reclaimability and erosion of Mancos shale, the literature review focused on these issues. It should be noted that the gathering of information is a continuing process. The major literature sources are listed herein. These references provide useful information as well as valuable additional references for continuing research.

Bureau of Land Management, 1985; Gully erosion, Technical Note 366, US Dept. of Interior, 181 pages.

Bureau of Land Management, 1979; Reclaimability analysis of the Emery coal field, Emery County Utah, EMRIA Report No. US Dept of Interior, 413 pages.

Heede, Burchard H., 1976; Gully development and control: the status of our knowledge, USDA For. Serv. Res. Pap. RM-169, 42 p. Rocky Mt. For. and Range Exp. Sta., Fort Collins, Colo.

Williams, R.D. and Schuman, G.E. (Editors). 1987. Reclaiming mine soils and overburden in the western United States, analytic parameters and procedures. Soil Conservation Society of America, Akeny, Iowa.

As stated previously, only the major reference sources are listed here. Other references are cited within the text.

PHASE II SITE CHARACTERIZATION

Climate

The Des Bee Dove haul road is located near the base of the eastern slope of the Wasatch Plateau in western Emery County, Utah. At higher elevations of the plateau, 10,000 feet, annual precipitation averages more than 15 inches, primarily as winter snowfall. This precipitation depletes the moisture from the westerly airflow thus making the downslope flow significantly dryer.

Data from the PacifiCorp East Mountain weather station, 1.5 miles northwest of the haul road site, at an elevation of 9,000 feet, indicates a mean annual precipitation of approximately 14.5 inches. The mean annual precipitation at the Hunter Power Plant, 10 miles southeast of the haul road site at an elevation of 5,800 feet, is 7.5 inches. The mean annual precipitation at the haul road site, elevation 7,000 feet, is estimated to be approximately 11 or 12 inches.

A comparison of the seasonal distribution of annual precipitation at East Mountain (water years 1980-81 thru 1988-89) and Hunter Plant (water years 1975-76 thru 1988-89) indicates the following (see pages 4 and 5):

LOCATION	SEASON	PRECIP. (IN)	% AN.PR.
East Mountain	Summer (Apr-Oct)	62.13	47.6
	Winter (Oct-Apr)	68.46	52.4
Hunter Plant	Summer	55.94	53.4
	Winter	48.77	46.6

The seasonal distribution of annual precipitation at the haul road site is expected to be similar to that of Hunter Plant. Most of the precipitation is received in the "summer" season primarily in the form of thunder storms in July and August.

Estimated annual temperatures at the haul road site were also extrapolated from the East Mountain and Hunter Plant average annual temperature data (water years 1985-86 thru 1988-89, pages 6 thru 9).

YEAR	AV. ANN. TEMP. (°F)	HIGH AV. TEMP. (°F)	LOW AV. TEMP. (°F)	HOTTEST MONTH	COLDEST MONTH
East Mountain					
85-86	40.2	62.7	25.1	Aug	Nov
86-87	40.1	60.3	19.5	Jul	Jan
87-88	38.6	62.6	15.3	Jul	Dec
88-89	38.9	61.8	20.1	Jul	Jan
Hunter Plant					
85-86	49.4	70.8	26.9	Aug	Dec
86-87	47.5	71.9	21.5	Jul	Jan

87-88	49.3	75.7	17.0	Jul	Jan
88-89	50.0	76.5	16.3	Jul	Jan

The average annual temperature at the haul road site is expected to be approximately 43° F. The high average temperature is expected to be approximately 66° F, occurring in July. The low average temperature is expected to be approximately 20° F, occurring in January.

The slope aspect at the haul road site is generally southwestern.

Soils

The soils at the haul road site are classified by the Soil Conservation Service as Rockland (SCS Soil Survey, Carbon-Emery Area, Utah 1970). Discussion of this soil type is included on pages 10 thru 12.

Additional soil chemical information is included on page 13. These soil analyses were performed in conjunction with the existing vegetation test plots.

Vegetation

Vegetation cover at the haul road site is very sparse (estimated at less than 25% overall) and is dominated by Halogeton glomeratus.

Slope Stability

Soils engineering and physical properties are discussed in the stability analysis performed by Chen Northern, Inc. This information is found on pages 14 thru 20.

Slope erosion has been monitored since 1986. This information is presented on pages 21 thru 24.

TABLE 1: EAST MOUNTAIN PRECIPITATION

Elevation - 9,005 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
80-81	1.28	0.39	0.05	0.29	0.52	2.77	0.64	0.87	0.11	0.57	0.85	2.55	10.90
81-82	1.93	0.53	0.97	3.22	0.14	1.67	0.00	0.45	0.09	1.86	1.10	2.61	14.57
82-83	0.38	2.90	1.39	1.30	1.81	1.98	0.92	0.71	0.61	1.27	4.83	1.62	19.71
83-84	0.76	2.43	2.42	0.27	0.65	1.22	0.50	0.22	1.18	1.90	2.33	0.64	14.53
84-85	3.27	0.97	1.67	0.49	0.59	1.77	1.35	1.73	0.28	2.47	0.12	2.31	17.02
85-86	1.15	2.38	0.87	0.30	2.10	1.43	1.05	0.38	0.53	0.87	2.24	1.63	14.92
86-87	1.57	0.39	0.16	1.37	1.37	1.65	1.16	1.77	0.58	2.49	1.16	0.06	13.73
87-88	2.77	1.91	1.29	1.42	0.00	0.99	2.08	1.03	0.81	0.45	0.96	0.91	14.61
88-89	0.61	0.43	1.56	1.00	0.68	1.03	0.26	0.47	0.43	1.19	2.44	0.49	10.59
89-90	0.28	0.39	0.16	0.74	2.08								

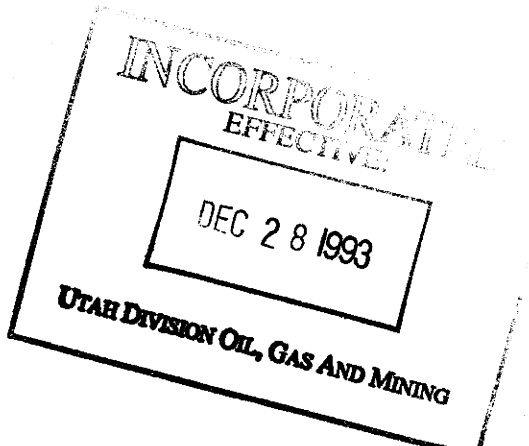


TABLE 2 : HUNTER PLANT PRECIPITATION

Elevation - 5,800 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
75-76	0.13	0.25	0.19	0.02	0.40	0.00	0.89	0.84	0.03	0.31	0.08	0.70	3.84
76-77	0.00	0.02	0.00	0.37	0.07	0.00	0.03	1.28	0.07	1.35	0.41	0.50	4.10
77-78	0.01	0.18	0.00	1.28	1.05	1.74	0.34	1.21	0.00	0.69	1.14	0.14	7.78
78-79	0.03	2.22	0.22	1.43	0.53	2.43	0.24	0.47	0.00	0.00	0.79	0.00	8.36
79-80	0.00	0.00	0.41	1.70	1.70	0.67	0.75	1.11	0.00	0.02	0.51	2.06	8.93
80-81	0.66	0.06	0.02	0.00	0.07	1.48	0.16	0.45	0.14	0.20	0.70	2.43	6.37
81-82	0.58	0.27	0.45	0.94	0.45	0.54	0.00	0.02	0.00	0.15	1.06	1.23	5.69
82-83	0.20	1.25	0.45	0.54	0.41	0.84	0.37	0.51	0.00	2.18	1.58	0.88	9.21
83-84	0.53	0.66	1.07	0.03	0.35	0.34	0.34	0.05	1.09	1.80	1.89	2.35	10.50
84-85	1.6	0.06	1.24	0.20	0.95	1.01	0.67	0.64	0.26	1.50	0.03	0.86	9.11
85-86	0.92	1.40	0.42	0.10	0.97	0.40	0.31	0.00	0.31	0.55	1.01	0.57	7.05
86-87	0.92	0.08	0.10	0.32	0.45	0.90	0.12	1.38	1.25	1.65	1.27	0.11	8.55
87-88	1.91	1.02	0.66	0.55	0.00	0.66	1.64	0.59	0.20	0.69	0.44	0.78	9.14
88-89	0.69	0.04	0.48	1.23	0.02	0.23	0.00	0.37	0.14	1.01	1.70	0.35	6.26
89-90	0.20	0.00	0.03	0.31									

Table 3: TEMPERATURES IN EMERY COUNTY, UTAH (1986 WATER YEAR)

Month	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal
1985								
Oct.	49.6	+1.2	49.6	+0.2	37.3	-0.2	41.5	+5.1
Nov.	34.7	-0.5	33.1	-2.9	24.4	-1.3	25.1	-2.1
Dec.	26.9	+0.2	27.6	+-.2	14.7	-1.1	26.7	+4.0
1986								
Jan.	30.3	+6.2	30.1	+6.5	18.6	+4.0	28.8	+5.1
Feb.	36.3	+7.9	34.0	+3.8	19.9	+0.6	27.3	+3.1
Mar.	45.3	+9.5	43.6	+5.9	30.4	+9.6	35.8	+7.6
Apr.	47.6	+3.0	45.1	0.0	29.5	+0.8	36.0	+2.0
May	55.5	+3.4	54.8	-0.1	39.0	0.0	34.9	-5.6
June	69.1	+7.7	69.1	+3.3	54.1	+5.5	59.1	+5.0
July	70.2	-1.8	69.1	-2.6	54.5	-1.2	59.3	-2.6
Aug.	70.8	+4.4	70.6	+1.2	57.6	+3.8	62.7	+0.9
Sept	56.8	-1.9	56.5	-3.9	43.1	-4.4	45.7	-4.8
TOTALS	49.4	+3.3	48.6	+1.0	35.3	+1.4	40.2	+1.9

Table 4: TEMPERATURES IN EMERY COUNTY, UTAH (1987 WATER YEAR)

Month	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal	Average Temp. (°F)	Departure From Normal
1986								
Oct.	30.6	-0.1	47.0	-2.4	36.5	-1.0	37.6	+1.2
Nov.	37.2	+2.0	37.8	+1.8	28.7	+3.0	36.4	+9.2
Dec.	28.9	+2.2	29.3	+1.9	17.1	+1.3	19.6	-3.1
1987								
Jan.	21.5	-2.6	24.4	+0.8	9.8	-4.8	19.5	-3.2
Feb.	31.4	+3.0	31.9	+1.7	13.0	-6.3	22.8	-0.9
Mar.	36.3	+0.5	34.6	-3.1	18.1	-2.7	26.0	+1.8
Apr.	50.8	+6.2	50.2	+5.1	34.2	+5.5	41.3	+13.1
May	56.5	+4.4	55.2	+0.3	42.6	+3.6	45.9	+5.4
June	69.1	+7.7	67.6	+1.8	50.6	+2.0	59.4	+5.3
July	71.9	+3.5	68.0	-3.7	N/A	---	60.3	-1.6
Aug.	71.1	+4.7	68.8	-0.6	55.0	+1.2	57.3	-4.5
Sept	65.1	+6.4	63.0	+2.6	49.6	+2.1	54.7	+4.2
TOTALS	47.5	+3.2	48.2	+0.6	32.3	-1.6	40.1	+1.3

TABLE 5: TEMPERATURES IN EMERY COUNTY, UTAH (1988 WATER YEAR)

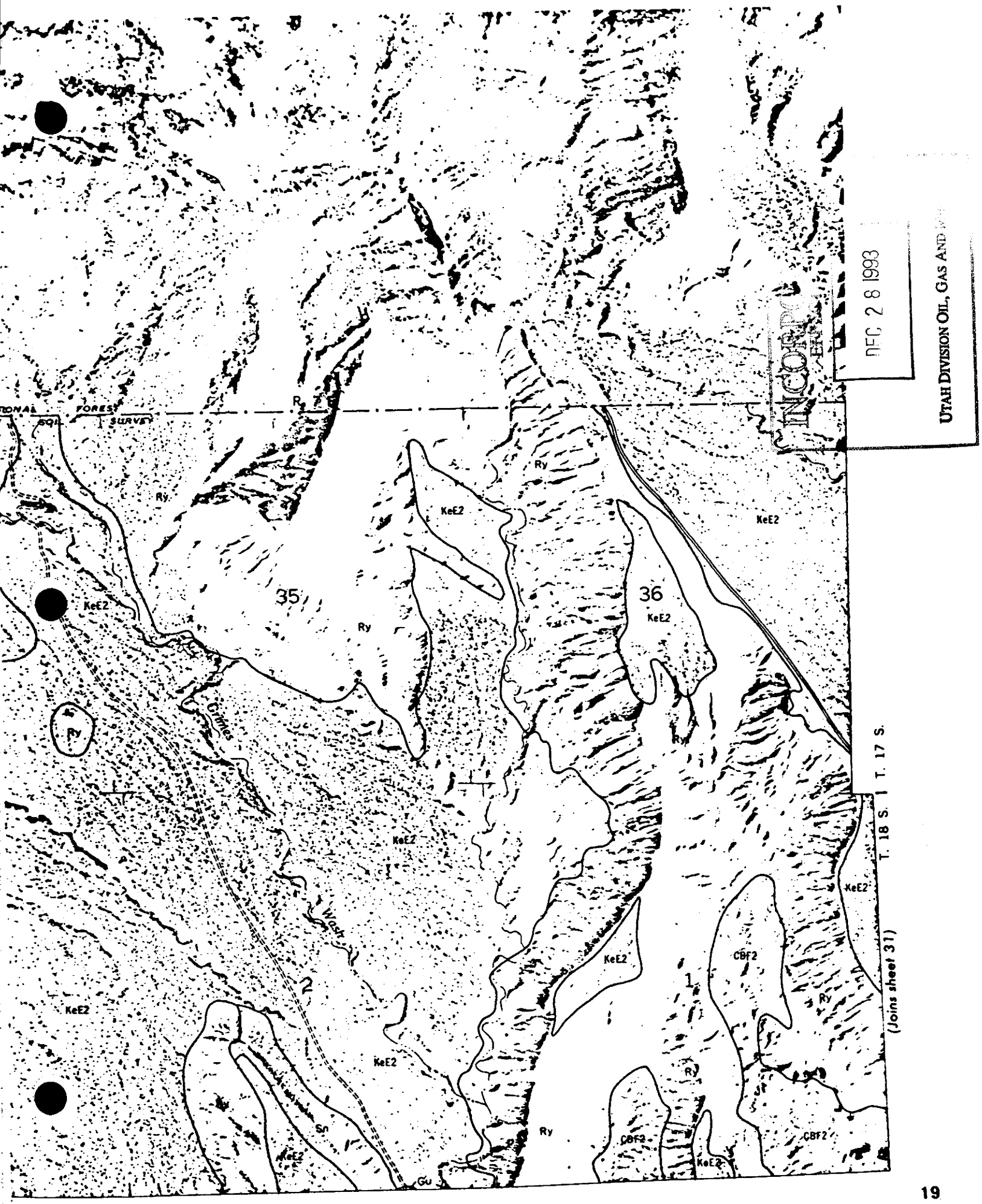
Month	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal
1987								
Oct.	55.1	+6.7	53.9	+4.5	41.4	+3.9	42.0	+4.8
Nov.	38.5	+3.3	35.8	-0.2	24.6	-1.1	25.8	-2.4
Dec.	25.0	-1.7	24.4	-3.0	11.2	-4.6	15.3	-6.1
1988								
Jan.	17.0	-7.1	20.5	-3.1	10.4	-4.2	17.7	-3.7
Feb.	31.4	+3.0	30.9	+0.7	16.3	-3.0	24.7	+0.7
Mar.	38.4	+2.6	36.2	-1.5	17.4	-3.4	25.9	-1.8
Apr.	49.1	+4.5	47.3	+2.2	32.8	+4.1	38.0	+2.6
May	57.0	+4.9	55.8	+0.9	40.2	+1.2	46.1	+4.2
June	71.0	+9.6	68.2	+2.4	53.1	+4.5	58.5	+3.2
July	75.7	+7.3	74.2	+2.5	58.4	+2.7	62.6	+0.9
Aug.	72.2	+5.8	70.1	+0.7	54.5	+0.7	60.0	-1.0
Sept	61.6	+2.9	60.8	+0.4	45.6	-1.9	47.0	-3.6
TOTALS	49.3	+3.5	48.2	+0.5	33.8	-0.1	38.6	-0.2

* Temperatures reported in degrees Fahrenheit.

TABLE 6 : TEMPERATURES IN EMERY COUNTY, UTAH (1989 Water Year)

Month	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal
1988								
October	57.4	+9.0	56.3	+6.9	45.3	+7.8	43.8	+5.9
November	38.4	+3.2	37.7	+1.7	23.6	-2.1	23.5	-4.2
December	26.8	+0.1	25.1	-2.3	10.9	-4.9	21.1	-0.3
1989								
January	16.3	-7.8	18.8	-4.8	10.3	-4.3	20.1	-2.1
February	27.0	-1.4	24.5	-5.7	12.7	-6.6	20.2	-3.5
March	45.3	+9.5	41.5	+3.8	28.9	+8.1	34.0	+5.7
April	54.1	+9.5	50.8	+5.7	35.6	+6.9	42.1	+6.0
May	58.9	+6.8	55.6	+0.7	43.0	+4.0	46.8	+4.4
June	66.4	+5.0	64.0	-1.8	42.2	-6.4	50.3	-4.5
July	76.5	+8.1	73.4	+1.7	57.9	+2.2	61.8	+0.1
August	69.7	+3.3	66.6	-2.8	50.5	-3.3	53.8	-6.4
September	62.8	+4.1	60.7	+0.3	45.2	-2.3	48.8	-1.6
TOTALS	50.0	+4.1	47.9	+0.3	33.8	-0.1	38.9	0.0

* Temperatures reported in degrees Fahrenheit.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spersed with areas of the Ravola soil (fig. 13). Both soils are on flood plains and alluvial fans.

Included in mapping were small areas of Billings silty clay loam.

Runoff is rapid from the Bunderson soil, and most areas contain gullies 5 to 20 feet deep and 500 to 1,300 feet apart. Head cutting is common, and it is forming shallow gullies. In places windblown hummocks less than 2 feet high occur. Typically, these are on the east and north sides of greasewood and other plants.

The soils in this mapping unit are suited to the production of range forage. Controlling gully erosion and regulating the amount and season of range use are needed. Clearing the brush and reseeding grasses are not feasible, because of the small amount of rainfall. (Both soils are in Capability unit VIIe–D, nonirrigated; Ravola soil is in Desert Loam Bottom range site)

Riverwash (Rv) consists of streambeds or riverbeds, including oxbow-loops and other channels. These areas are exposed at low water and subject to shifting during periods of high water because of deposition and erosion. The deposited materials are extremely variable, ranging from boulders in the upper part of streams to silt and clay in the lower, more nearly level areas. Most areas are channeled and have little or no cover of vegetation. (Capability unit VIIIw–4, nonirrigated; not rated for other uses)

Rock land (Ry) is a miscellaneous land type having a surface 50 to 70 percent covered by stones, boulders, and outcrops of shale and sandstone. Most of this land type is moderately eroded, but many areas are severely eroded. Soil characteristics are almost obscured by the stones and boulders. The slopes are very steep to perpendicular, but typically they are between 50 and 80 percent.

Included in mapping were gently sloping, deep fine sandy loams. Intermingled with the sandstone outcrops were inclusions of shallow fine sandy loams. Also included on some of the north-facing slopes in the mountains along the west side of the survey area were small areas of an unidentified soil.

This land type has almost no value for farming, although some areas have a sparse cover of grass, sagebrush, pinon, and juniper. This vegetation grows on all exposures, but it is dominant on north and west exposures. Small areas are accessible to livestock and wildlife, but most of the land type is too steep and rocky for grazing. (Capability unit VIIIs–3, nonirrigated; not rated for other uses)

Figure 13.—An area of Ravola-Bunderson complex, 1 to 3 percent slopes, eroded. The nearly bare, light-colored slickspots are the Bunderson soil.

Saltair Series

Soils of the Saltair series are deep, poorly drained, very strongly saline, moderately fine textured, and nearly level to gently sloping. They occupy moderate to large areas on alluvial fans, on flood plains, and in narrow alluvial valleys. These soils have formed in alluvium derived from marine shale and sandstone. The vegetation is greasewood, saltgrass, and kochia, but bare surfaces are common. Elevations range from 4,000 to 6,500 feet. The annual rainfall is 6 to 11 inches, and the mean annual soil temperature is 47° to 54° F. The frost-free season is 110 to 160 days.

In a typical profile, the surface layer is light brownish-gray, strongly calcareous, very strongly saline silty clay loam about 7 inches thick. The underlying material is light brownish-gray and light-gray heavy silt loam that is very strongly saline in the upper part. Platy crusts of salt on the surface, underlain by layers of soft, granular material, are common. The content of salt is 2 percent or more within 20 inches of the surface.

This soil is used for range, but the quality of the forage is poor.

Representative profile of Saltair silty clay loam in a pasture, 1,200 feet north and 500 feet west of the SE. corner of section 13, T. 17 S., R. 9 E. in Emery County, Utah:

A11sa—0 to ½ inch, grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; weak, thin, platy structure breaking to moderate, fine, granular structure; soft, firm, very sticky and plastic; plentiful large roots; many medium and fine vesicular pores; strongly calcareous; strongly alkaline (pH 8.9); thin salt crust; clear, smooth boundary.

A12sa—½ inch to 7 inches, light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; many, fine, distinct yellowish-brown (10YR 5/6) mottles; weak to moderate, fine, angular blocky structure; very hard, very firm, very sticky and very plastic; plentiful medium and fine roots; common medium and fine pores; strongly calcareous moderately alkaline (pH 8.3); very strongly saline efflorescent salt on many ped surfaces and in pores clear, smooth boundary.

C1gsa—7 to 14 inches, light brownish-gray (2.5Y 6/2) heavy silt loam, grayish brown (2.5Y 5/2) when moist common, fine, distinct, yellowish-brown (10YR 5/4 mottles and common, fine, faint, gray (N 5/0 mottles; weak, fine, angular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common medium pores; strongly calcareous; very strongly saline; efflorescent salt on many ped surfaces and in pores; strongly alkaline (8.5); gradual, wavy boundary.

CAPABILITY UNIT VIIIw-4 (NONIRRIGATED)

This capability unit consists of the land type Riverwash, which is gravelly and cobbly. Areas of this land type are subject to damaging overflows and do not support the growth of plants. Their main use is for wildlife habitat.

CAPABILITY UNIT VIIIw-8 (NONIRRIGATED)

This capability unit consists of deep, poorly drained, very strongly saline, fine textured and moderately fine textured soils that generally have a crust of salt ½ to 1 inch thick on the surface. These soils are in the Cache, Libbings, and Saltair series.

Because of their high content of salt, these soils have no known farm use. Plants cannot grow on them. Experience indicates that reclaiming these soils for use as salt meadow pasture is economically not feasible.

CAPABILITY UNIT VIIIs-3 (NONIRRIGATED)

This capability unit consists only of bare, steep ledges of Rock land on which plants do not grow. The only use is for wildlife habitat, water supply, and esthetic purposes.

CAPABILITY UNIT VIIIs-7 (NONIRRIGATED)

This capability unit consists of rough, broken, and nearly bare areas of Badland and of a Bunderson soil. These areas have little potential for the production of plants and are sources of silt carried by runoff.

Small areas are used for a limited amount of grazing. The areas are used mainly, however, as a habitat for wildlife, for water supply, and for esthetic purposes.

Estimated yields

Table 1 gives the estimated average acre yields of the principal crops and pasture grown on irrigated soils under two levels of management. These yields are estimated on the basis of records obtained from farmers for the specific soils, on field observations of soil scientists, and on data compiled by economists of the Colorado River Storage Project. If no information was available for a particular soil, the estimates were made on the basis of yields on a similar soil. Only soils that are suitable for the crops and pasture specified are listed in table 1. In a given year, yields may be considerably higher or lower than the estimated average.

Under both levels of management, yields are based on a generalized crop rotation consisting of 5 years of a legume, 2 years of row crops, and 2 years of small grain. This rotation or a variation of it is used in most of the survey area. The kinds of row crops to be grown depend on the expected supply of irrigation water. Oats or barley normally are grown as a nurse crop to new seedings of alfalfa.

The yields in columns A are those that can be expected under average, or common, management. Under common management, phosphorus fertilizer is applied sparingly or not at all; nitrogen is seldom used. Most of the available animal manure is spread. Sugar beets generally are fertilized with phosphorus and nitrogen.

Under common management, water-control structures generally are inadequate, and water is applied without enough regard to proper length of run or to the timely needs of crops. Pastures are not clipped, rotation grazing is not practiced, and no commercial fertilizer is applied. In some instances droppings are scattered, but generally they are not.

The yields in columns B are those expected over a period of years under a moderately high level of management. This management provides that phosphorus fertilizer is applied when new seedings of alfalfa are being established and again after 2 or 3 years. Nitrogen fertilizer is used on row crops after the first year out of alfalfa and occasionally on small grains, unless animal manure is available. All available animal manure is spread. Tillage is reduced to essential, timely operations to avoid traffic pans or compacting the soil. In addition, operators use control structures for handling irrigation water, use proper lengths of runs that are adapted to soil conditions, and apply water in the quantity that satisfies crop requirements.

Under a moderately high level of management, irrigated pastures generally contain about 50 percent alfalfa and 50 percent grass. Regardless of the amount of alfalfa, fewer animals die of bloat when rotation grazing is used than when it is not used. Alfalfa is allowed to mature to the hay stage before animals graze it, and then animals are concentrated so that all the forage is consumed within a few days.

Pastures that are rotated, and in which alfalfa is the primary source of forage, should be grazed about 6 days and then rested for 28 to 40 days to allow for the regrowth of plants. The length of the regrowth period is about the same as the interval between hay cuttings. Six paddocks, or grazing units, generally are well suited to rotation grazing. This is the minimum number of paddocks that can be used if irrigation water is applied about every 14 days. This number allows for an irrigation immediately after grazing is finished and again 6 to 7 days before the next grazing so that the soil is dry when grazed.

At the stocking rate of 20 cows per acre, 6 days are needed to harvest efficiently the forage in a 5-acre pasture. Pastures grazed at this rate seldom need to be mowed for weed control oftener than every other year. Droppings are spread each year.

From 40 to 50 pounds of available nitrogen fertilizer are applied before growth starts each spring. Phosphorus fertilizer is applied every 2 or 3 years.

The length and warmth of the growing season at Green River allows farmers to have a greater variety of crops and larger yields than are feasible in the other parts of the survey area. For this reason, the soils at Green River are designated "extended season" phases to separate them from their counterparts in Castle Valley. For example, at Green River three full crops of alfalfa are obtained, and corn matures and is harvested for grain. In Castle Valley, on the other hand, alfalfa produces only two full crops and part of a third, and corn does not mature for grain. The frost-free period in Green River is 140 to 160 days, and the average temperature in summer is 76° F. In Castle Valley, the frost-free season is 110 to 130 days, and the average temperature in summer is 66° F.

The amount of soluble salts or alkali in the soil determines the kinds of crops that can be grown, and it affects crop yields.

FGL

FRUIT GROWERS LABORATORY, INC.

May 19 ,1989

LAB NO:15913 03

RE: LANDSCAPE SOIL ANALYSIS

Nature-Gro Corp.
P.O. Box 4135
Pacoima, CA 91381

Location: Utah P & E, below road
Description:Preplant Landscape
Date Sampled: 05/04/89
Sampled by: Nature-Gro

Date Received: 04/27/89
Depth: 0-6"

TEST RESULTS

Test Description	Your Analysis		Optimum Range	Comment
Moisture	1.00	%	1/2 Satn. %	Too Dry
Saturation	32.00	%	--	Loam
Nitrate-Nitrogen	6.00	PPM	10 - 40	Low
Phosphorus	2.00	PPM	13 - 40	Very Low
Exch. Potassium	270.00	PPM	81 - 300	Ample
Limestone	7.30	%	0	See Below*
pH	7.90		5.8 - 8.2	OK
Soil Salinity	20.70		0.3 - 2.0	Excessive
Gypsum Requirement	4.00	T/AF	0	Apply
Lime Requirement	0.00	T/AF	0	OK
Sulfate-Sulfur	95.80	meq/l	< 20	Excessive
Chloride	39.00	meq/l	<3	Excessive
Boron	0.50	PPM	0.02 - 1.0	OK
Calcium	49.30	meq/l	>2.0	Ample
Magnesium	16.30	meq/l	>1.5	Ample
Sodium	175.80	meq/l	See SAR/ESP	--
SAR	30.70		<7	Too High
ESP	30.30		<10	Too High
Zinc	2.40	PPM	> 0.7	Ample
Manganese	1.60	PPM	>1.4	Ample
Iron	16.90	PPM	>8	Ample
Copper	0.80	PPM	>0.2	Ample

Soil pH & Limestone levels are important to consider when making plant selections. Soils having pH levels above 7.0 should not be used for plants that require acid soil conditions. Soils containing free limestone should not be used for plants that require acid soil conditions or are sensitive to limestone.

FGL, Inc.

Darrell H. Nelson

MAIN OFFICE – 853 CORPORATION STREET – P.O. BOX 272 – SANTA PAULA, CALIFORNIA 93060-0272
BRANCH OFFICE & LABORATORY – 2500 STAGECOACH ROAD, STOCKTON, CALIFORNIA 95205, (209) 942-0181

Chen Northern, Inc.

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August 29, 1990

APPENDIX III

Des-Bee-Dove Mine
Sedimentation Pond & Road
Stability Analysis

Johansen & Tuttle
90 South 100 East
Castledale, Utah 84513

Attention: Mr. Craig Johansen

Subject: Debris Basin Dike and
Road Fill Slope Stability Analysis
Project No. 5-462-90

Gentlemen:

At your request, we have performed a slope stability analysis for the two embankments referenced above. This letter presents the results of our analysis for these embankments which are located near Orangeville, Utah. The analysis was conducted for the purpose of estimating the factor of safety against slope failure for these embankments.

Site Conditions

A representative of our firm has not been at the site to review site conditions and consequently we have relied upon the information provided by your firm in order to understand site conditions. It is our understanding that the cross-sectional data for the both the dike and the road fill as provided by your firm represent typical cross-sections of the slopes to be analyzed. The cross section as analyzed for the Road Fill and the Debris Basin are shown on Figures 1 and 4, respectively. We further understand that there is no anticipated phreatic surface in the embankment of either project and that the foundation soils for both projects are essentially the same as the embankment material.

We understand that field density testing indicates that the soil at the road embankment has an in situ dry density which varies from 112.5 to 122.2 pounds per cubic foot and that the moisture content varies from 9.8 to 11.2 percent of the dry density. Similarly, the soil within the Debris Basin Dike has an in situ dry density which varies from 102.7 to 115 pounds per cubic foot with a moisture content in the range 11.6 to 19.9 percent. Soil samples representative of the embankment and foundation soils, at each of the embankment sites, were delivered to our laboratory.

Laboratory Testing

The samples delivered to our laboratory were observed and visually classified. Pertinent laboratory testing was conducted on each sample to determine the engineering and physical properties of the soils in general accordance with ASTM or other approved procedures.

Tests Conducted:	To Determine:
Grain-size Distribution Figures 2 and 5	Size and distribution of soil particles; that is, clay, silt, sand, and gravel.
Atterberg Limits Figure 2	A method of describing the affect of varying water content on the consistency of fine-grained soils.
Moisture-density Relationship Figures 2 and 5	The optimum moisture content for compacting soil and the maximum dry unit weight (density) for a given compactive effort.
Direct Shear Figure 3 and 6	General soil strength properties.

Results of the laboratory tests are summarized on the enclosed figures as indicated above. Based on the laboratory test results soil samples were classified in accordance with ASTM D-2487 which is based on the Unified Soil Classification System.

Soil Conditions

Road Fill

The embankment and foundation soils contained in the road fill consist of a clay with moderate plasticity. This clay is primarily fine grained but contains chunks of claystone which accounts for the gradation as shown on Figure 2. The moisture density relationship indicates that the soil has a maximum dry density of 124 pounds per cubic foot and an optimum moisture content of 10.5 percent.

Based on the field density tests soil samples were reconstructed to a dry unit weight of 115 pounds per cubic foot at a moisture content of 10 percent for direct shear testing. Due to the lack of a phreatic surface through the embankment the direct shear testing was completed at the moisture density indicated above. Direct shear test results indicated a friction angle of 36 degrees and a cohesion intercept of 1,500 pounds per square foot. The direct shear results seem somewhat high for anticipated field conditions. As a result, for use in the slope stability analysis, the friction angle has been reduced to 30 degrees and the cohesion to 1,200 pounds per square foot. It should be noted that if a phreatic surface were to be established within the road fill that this could lead to a substantial softening of the soils as measured during this testing.

Debris Basin

The soil contained in the embankment and foundation of the Debris Basin Dike consists of silty sand with gravel. This soil is broadly graded and has low to no plasticity. The moisture density relationship indicates a maximum density of 125 pounds per cubic foot and a moisture content of 9.5 percent.

Based on results of the field density tests, samples were reconstructed for direct shear testing at a dry unit weight of 105 pounds per cubic foot and moisture content of 15 percent. Prior to the initiation of the direct shear testing these samples were allowed to saturate. Direct shear testing indicated a friction angle of 32 degrees with no cohesion. Due to the significant amounts of coarse rock removed from the soil in order the prepare samples which could be tested in the direct shear testing apparatus, it is felt that a slight increase in the test results for this sample would be appropriate for use in stability analysis. Soil strengths used in the stability analysis are a friction angle of 34 degrees and a cohesion intercept of zero.

Stability Analysis

A computer model of Bishop's Simplified Method was used to perform the actual stability calculations. The computer model used was Stabl5M, which was developed at Purdue University for the Federal Highway Administration.

The Bishop's Simplified Method of Analysis is a limiting equilibrium method which relates, through the use of a factor of safety, the available shearing strength and the shear stresses which develop within the soil mass. This relationship provides a limiting value of which the forces acting to cause failure are in balance with those acting to resist failure. The limiting value of the factor of safety is 1.0 at which the shearing stresses are equal to the maximum shearing strength and failure of a particular potential failure mass is eminent.

Analyzing the stability of a particular potential failure mass using the Bishop's method requires that the mass be divided into several slices. The analysis to determine slope stability then considers all the forces acting on each individual slice or body. In the Bishop's method the forces which act on each slice are resolved vertically. This yields an equation of equilibrium in which the unknowns are the normal and tangential forces acting on the failure surface and the difference between the vertical side forces. The tangential force on the failure surface is the shearing force acting to cause failure of the body. The normal force is used in the Mohr-Coulomb strength criteria of the soil.

In order to reduce the number of unknowns, Bishop applied the limit equilibrium condition that the shearing stress equals the available strength, divided by the factor of safety. Ultimately it is the factor of safety that is being solved for. In the Simplified Bishop's Method it is assumed that the difference in the vertical side forces is small enough to be neglected. Comparison of this method with more rigorous methods shows that this assumption results in a slightly lower or more conservative factor of safety. In general, however, the results of this method are very close to the more rigorous methods and the Bishop's Simplified Method is considered to be appropriate for use in slope stability analysis.

Both embankments were analyzed under static conditions. In addition the Debris Basin was also analyzed under earthquake conditions. For the conditions of this study, it is felt that the pseudo static method of analysis is appropriate for use in the dynamic analysis.

The pseudo static method of analysis assumes a constant horizonal acceleration of a given value. The site of the debris basin is located within Zone 2-B of the Uniform Building Code Seismic Zone Map of the United States. It is estimated that at the site there is a 90 percent probability that the site will experience a maximum horizonal acceleration of 0.10g in the next 50 years and 0.2g during the next 250

years. It has been estimated that for use in seismic Zone 2 that a pseudo static coefficient or constant acceleration of 0.10g is appropriate. This value is used under earthquake conditions in this study.

Analysis Results

	Factor Safety	Required Safety Factor
Road Fill	1.72	1.3
Debris Basin, Down Stream	1.65	1.5
Debris Basin, Down Stream with Earthquake	1.28	1.2
Debris Basin, Up Stream	2.20	1.5
Debris Basin, Up Stream with Earthquake	1.63	1.2

Conclusions

Based on the assumptions used in this analysis, as previously discussed, it is our opinion that the slopes under consideration have factors of safety against failure in excess of those which have been set as a required minimum. As such, we feel that these slopes should be considered stable.

It should be noted, however, that a change in field conditions could significantly alter the results of this analysis. One of the most common causes of slope failures is the presence of unaccounted for seepage water which can cause softening of cohesive soils and, in all types of slopes, result in pore pressures which reduce slope stability. As with all embankments, monitoring of field conditions is important to determine that field conditions do not change. Where field conditions do change, stability of slopes needs to be reconsidered.

Limitations

This analysis has been completed in accordance with general accepted soil engineering practices in this area. The results of this analysis and the conclusions contained in this letter are based upon the data provided from the client and the assumptions regarding field densities and phreatic surface. If actual conditions appear to be different from those described herein this office should be advised at once so that reevaluation and recommendations may be made.

CHEN-NORTHERN, INC.

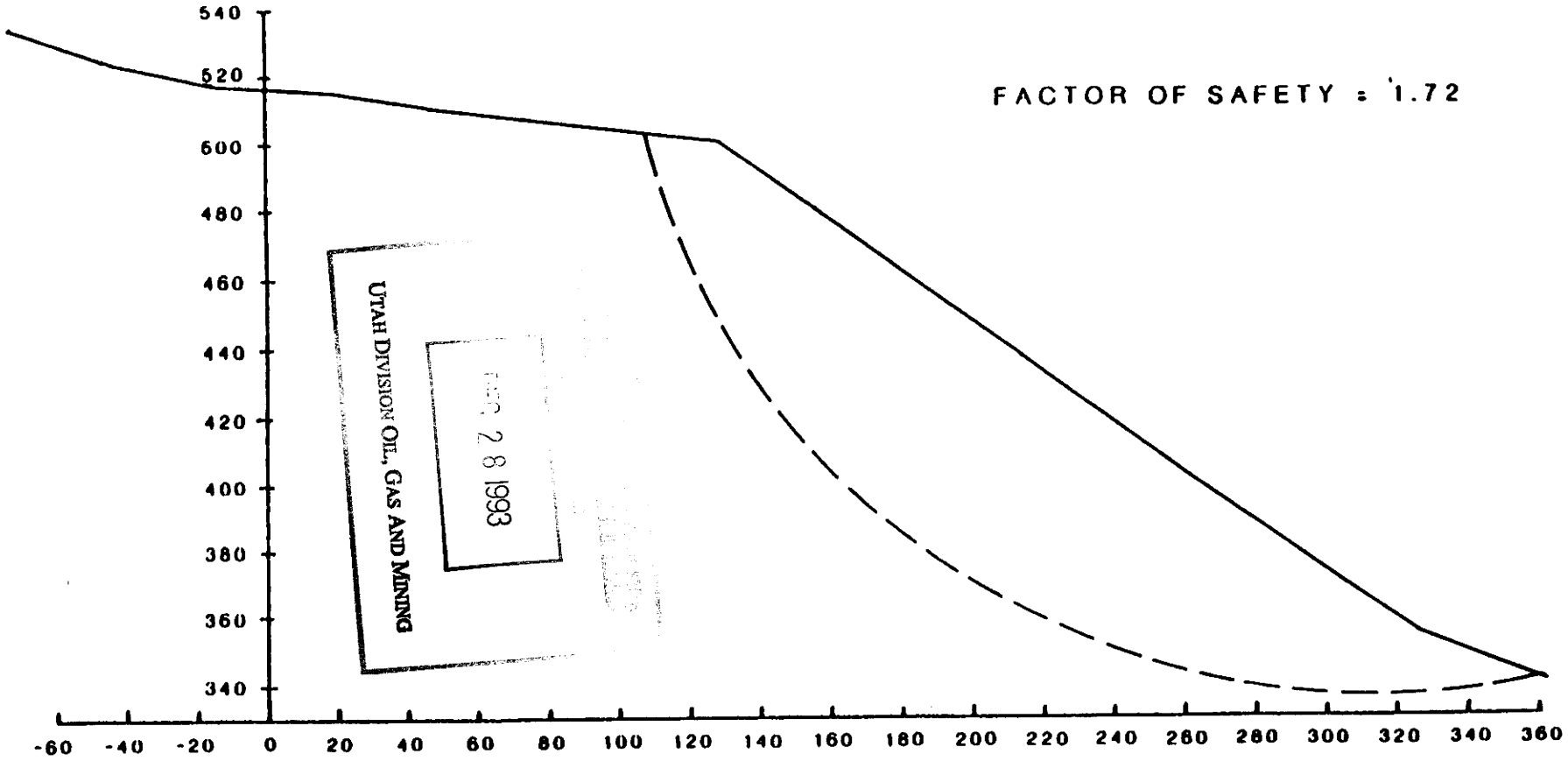
David K. Marble

David K. Marble, P.E.

Rev. by WVJ, P.E.

DKM:ew

Enclosures-6



#546290	Chen Northern, Inc.	ROAD FILL EMBANKMENT	Figure 1

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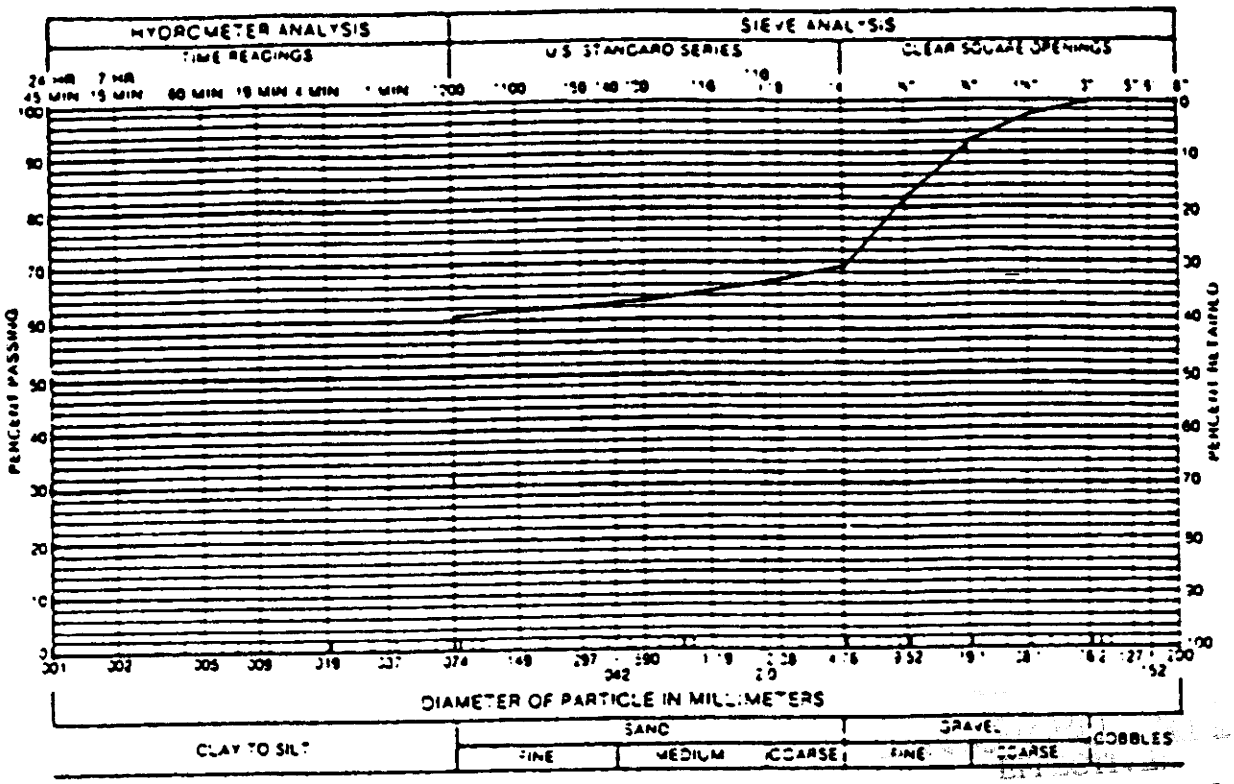
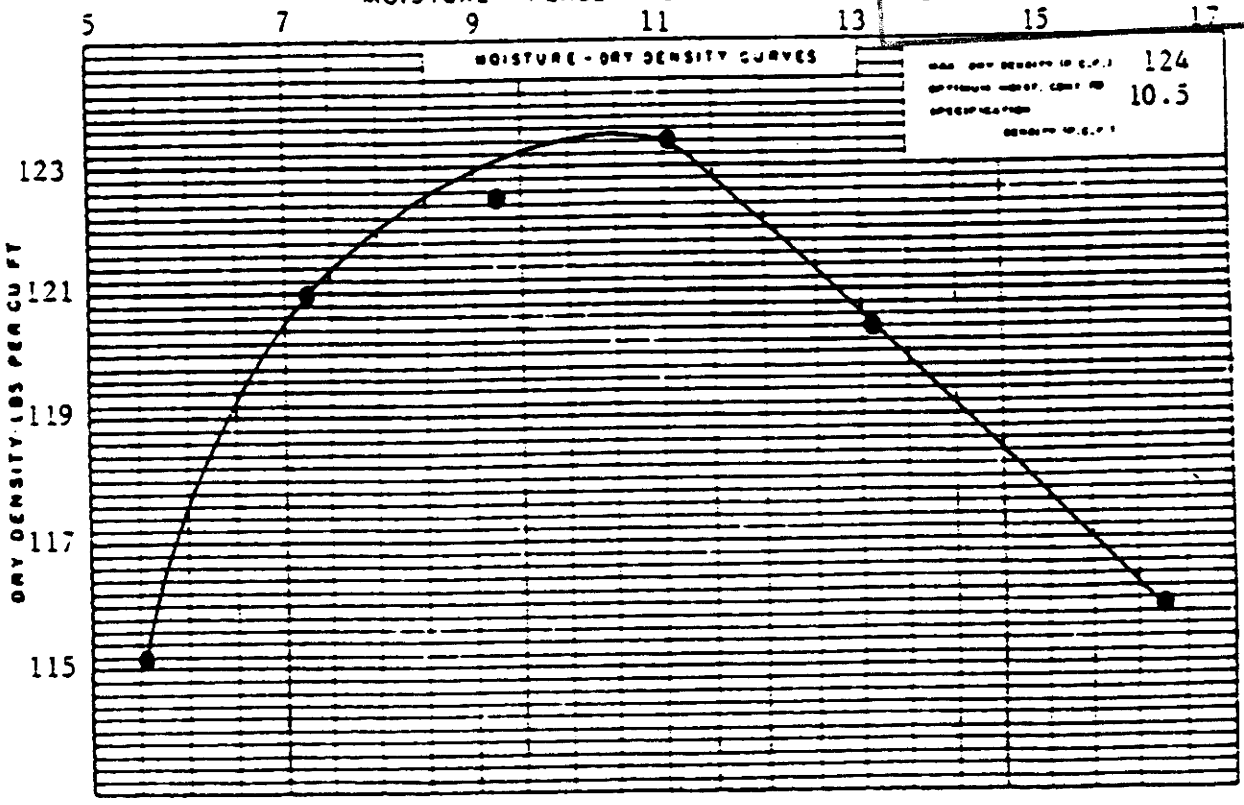
Chen Northern, Inc.



GRADATION TEST RESULTS

GRAVEL	32 %	SAND	7 %	SILT AND CLAY	61 %
LIQUID LIMIT	31 %	PLASTICITY INDEX	15 %		



COMPACTION TEST RESULTS

COMPACTION TEST PROCEDURE

SAMPLE OF (CL) Lean Clay

FROM Road Fill DEPTH

Job #5-462-90

Fig. 2

28

CA-3

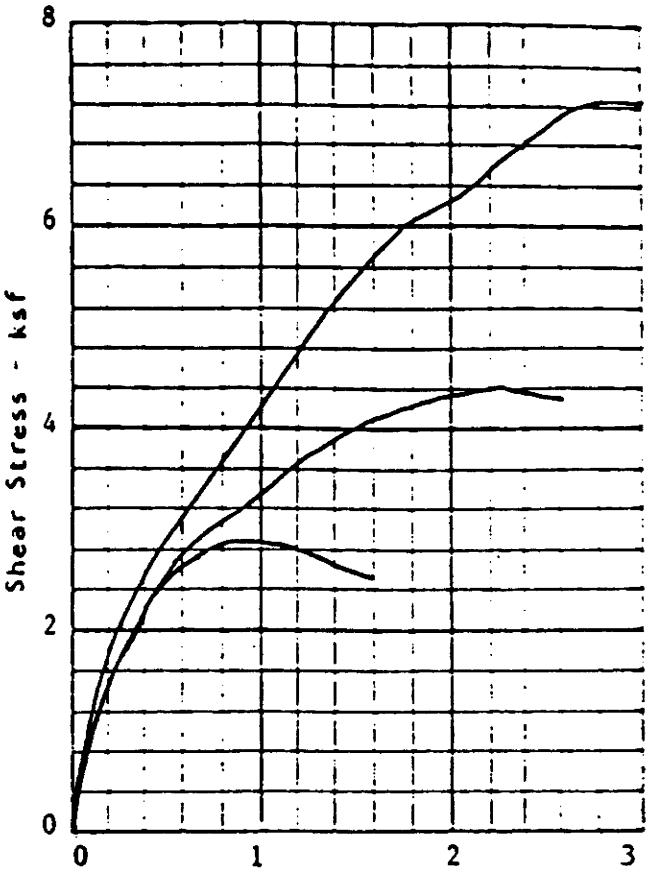
TEST NUMBER	1	2	3	4
LOCATION	ROAD-FILL	ROAD-FILL	ROAD-FILL	
HEIGHT-INCH	1"	1"	1"	
DIAMETER-INCH	2.4"	2.4"	2.4"	
WATER CONTENT - %	10	10	10	
DRY DENSITY - pcf	115	115	115	
CONSOL. LOAD - ksf	2	2	8	
NORMAL LOAD - ksf	2	4	8	
SHEAR STRESS - ksf	2.81	4.48	7.20	

TYPE OF SPECIMEN: Remolded

SOIL DESCRIPTION: (CL) Lean Clay

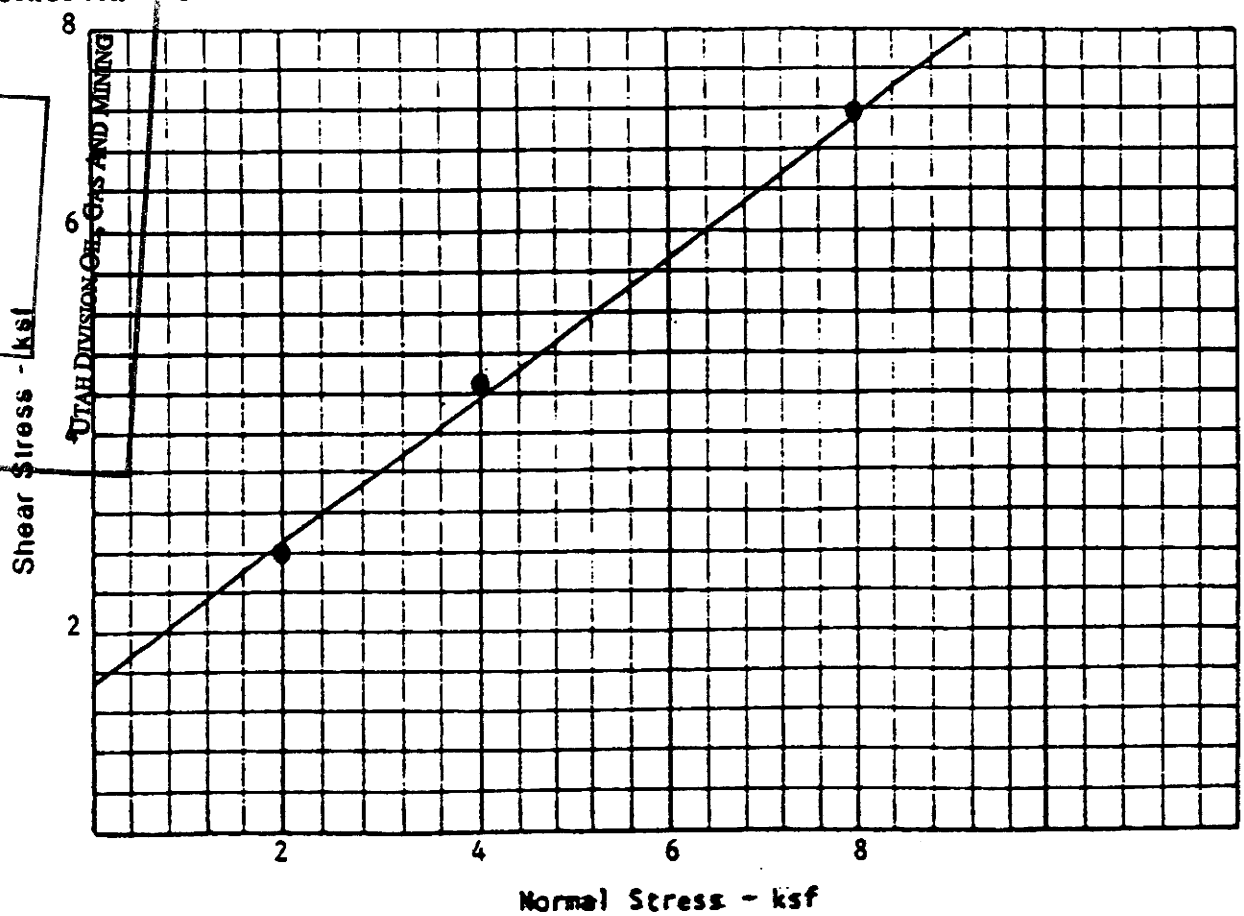
TYPE OF TEST: Unsaturated

Shear Rate 0.12 MM/MIN



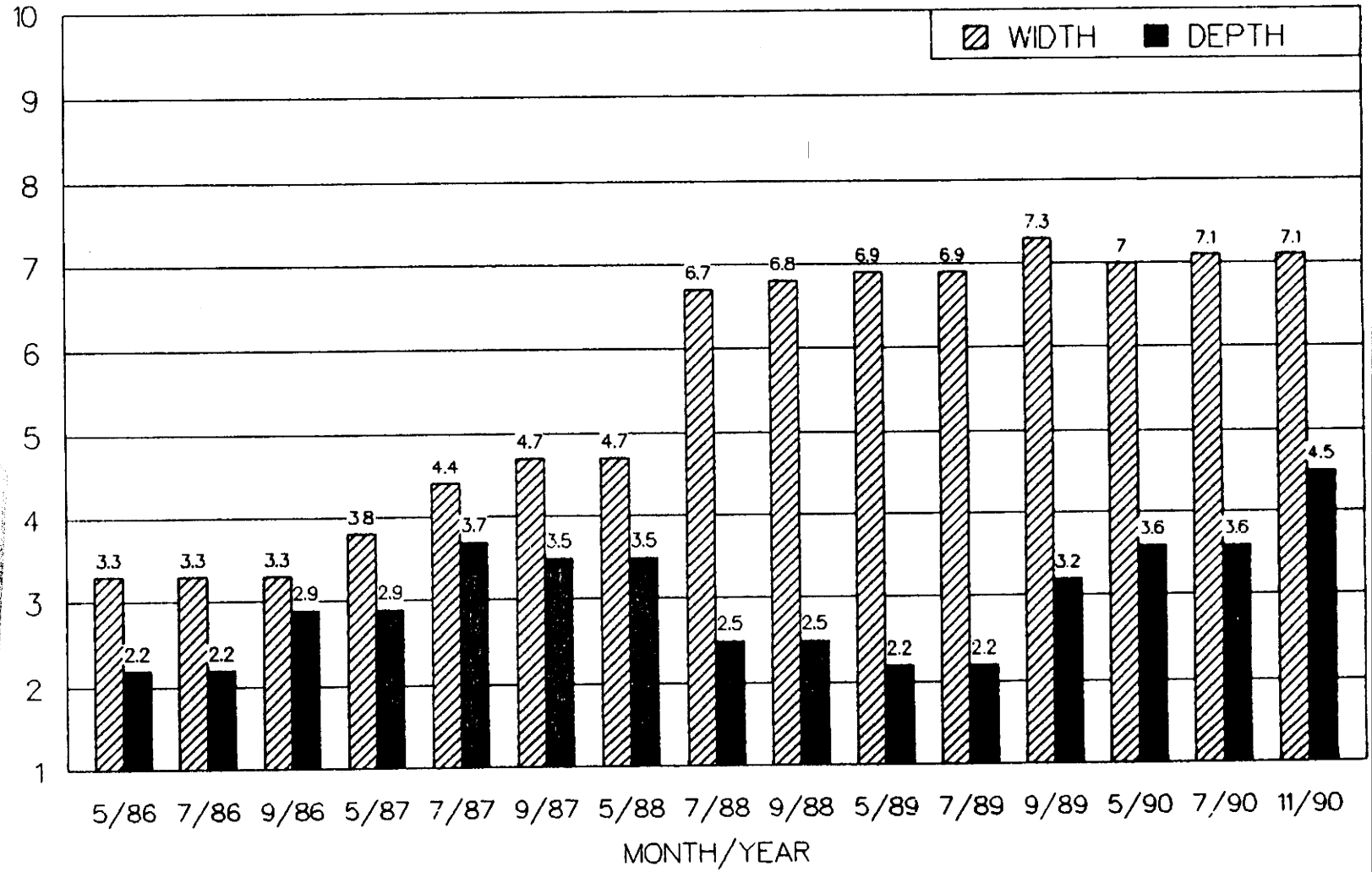
Friction Angle = 36°

Cohesion = 1.5 ksf



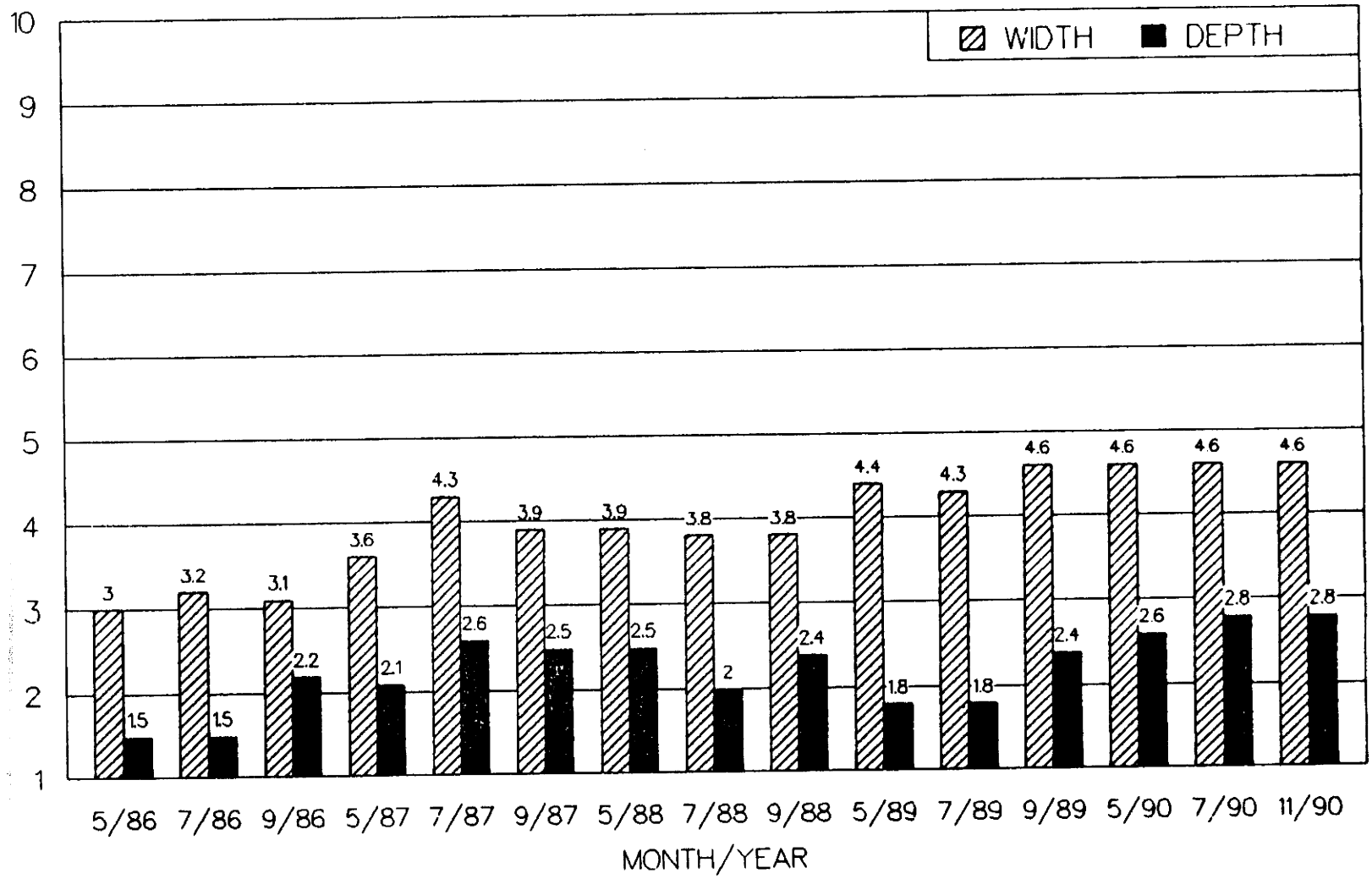
DES-BEE-DOVE HAUL ROAD EROSION
1986 THRU 1990

SITE 1



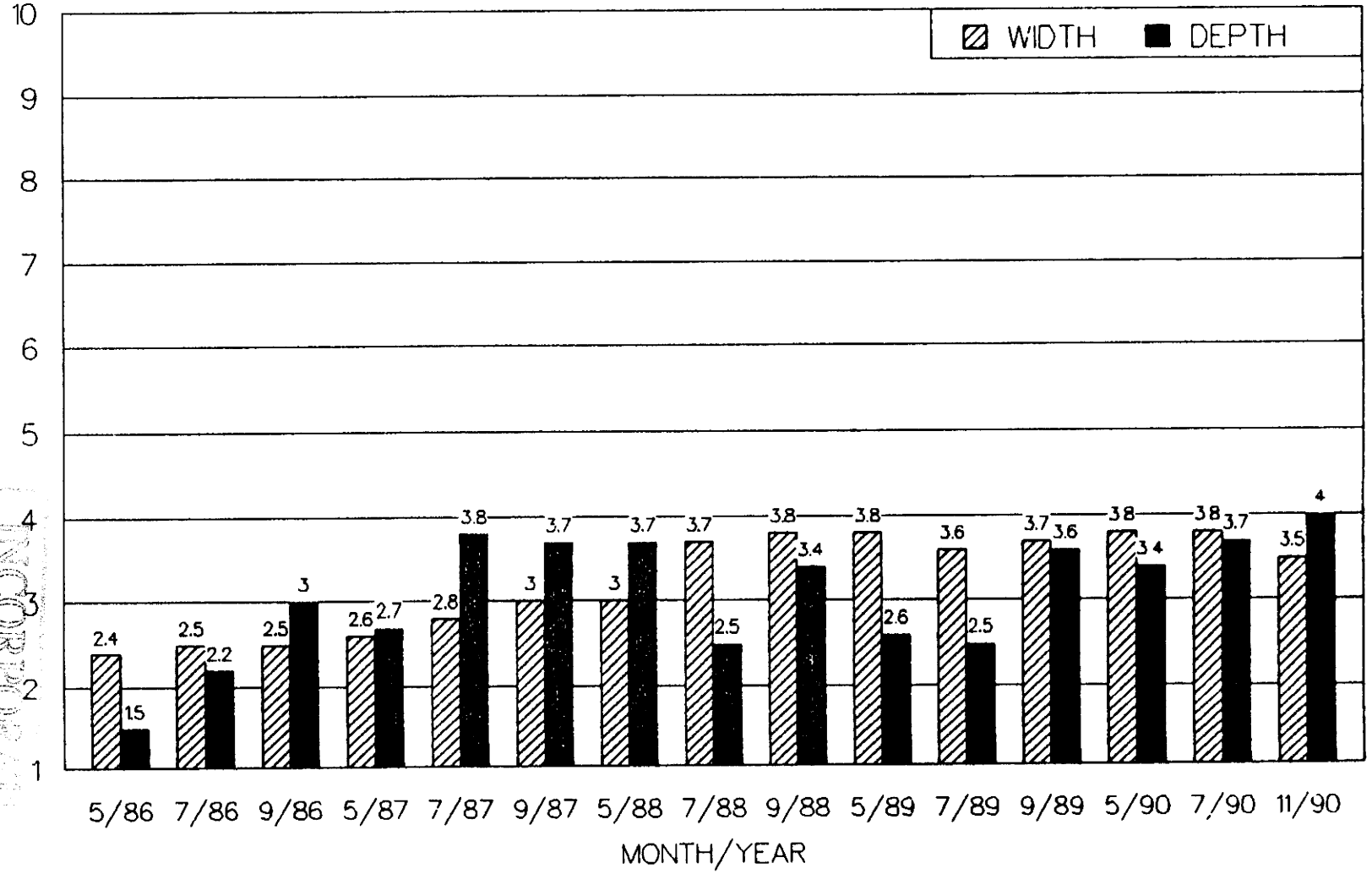
DES-BEE-DOVE HAUL ROAD EROSION
1986 THRU 1990

SITE 2



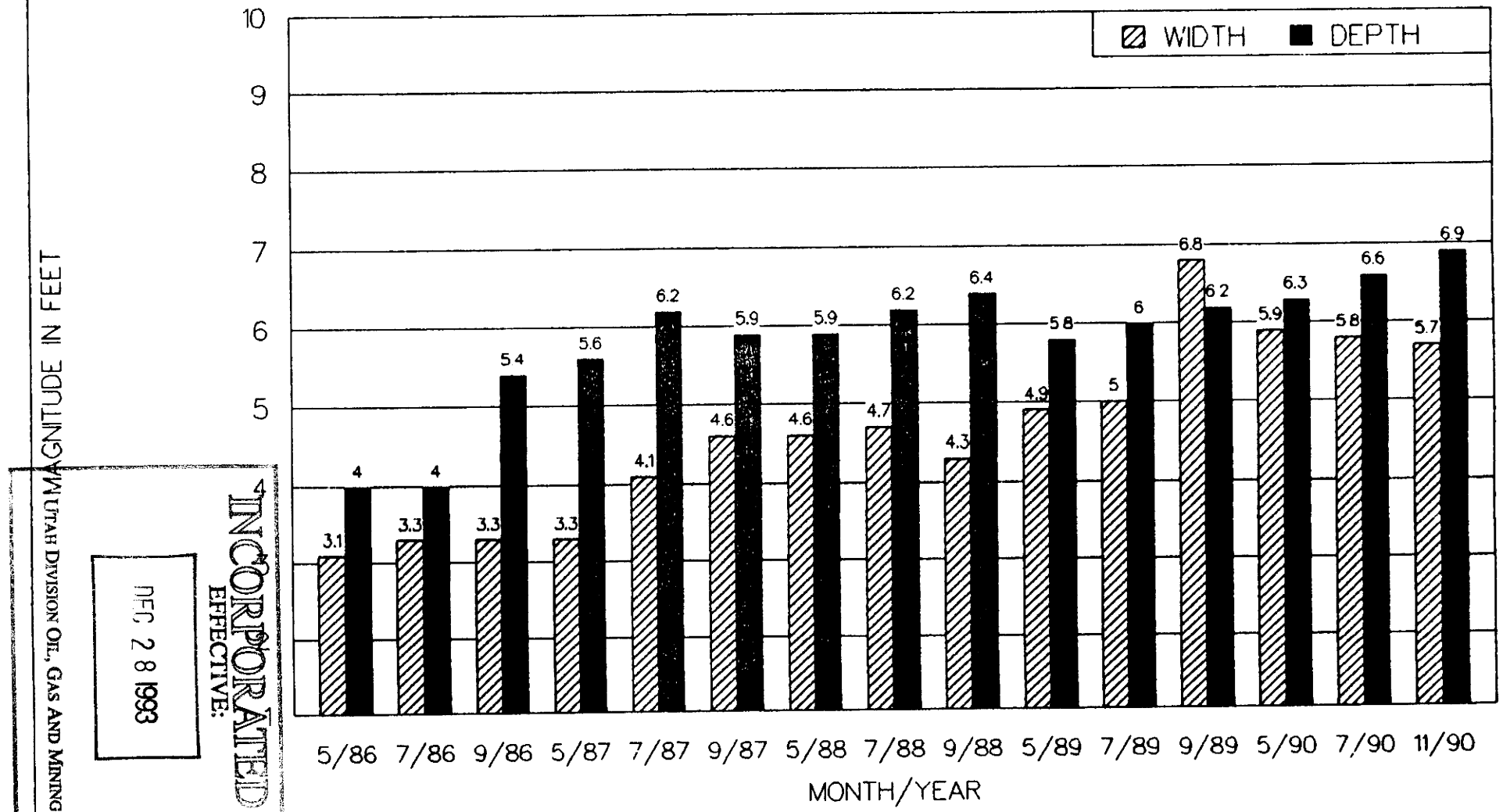
DES-BEE-DOVE HAUL ROAD EROSION
1986 THRU 1990

SITE 3



DES-BEE-DOVE HAUL ROAD EROSION
1986 THRU 1990

SITE 4



MAGNITUDE IN FEET

PHASE III DESIGN DEVELOPMENT

The primary objective of the reclamation study is to determine the reclaimability potential of the disturbed Mancos shale and to assess the effectiveness of the reclamation methodologies outlined in the Des Bee Dove Permit Application Package.

A secondary objective is the stabilization of erosion rills and gullies.

Effective reclamation will preferably include revegetation. Establishment of a vegetative cover will help to reduce and control erosion.

Existing site characteristics create marginal conditions for revegetation. These characteristics include; climatic factors (lack of precipitation and southwestern exposure, lack of topsoil, existing soil characteristics (low essential elements, high salinity, high sulfur and chloride, poor texture).

Similar characteristics existed at the Emery Coal Field (BLM EMRIA Report No. 16). Measures to address these factors included admixing of better soil materials or power plant fly ash with the existing soil. Proper admixing may dilute high soil elements and supplement low ones.

In addition to dilution, admixing with fly ash or other materials of less density than the Mancos, results in improved physical characteristics including increased pore volume, moisture availability and air capacity.

Admixtures proposed for the haul road test plots (See Map Cm-10602-DS Sheet 1 of 3) include better quality soil and coal spoil materials. Fly ash is not proposed because the elements which it would add to the Mancos (i.e. copper, zinc, calcium) are present in adequate concentrations. It is felt that the other admixtures are more suitable for improving the physical characteristics of the Mancos.

The potential for coal spoil materials to support vegetation has been observed at various abandoned mine refuse piles. Therefore, it appears that this material is a viable admixture.

Observations of natural conditions indicate that a mixture of soil and Mancos also supports vegetation.

The following procedures are proposed for admixing of materials at the haul road test plot site (refer to page 28):

1* Sample and analyze natural mancos/shale sites which support vegetation.

2* Sample and analyze coal spoil sites which support vegetation.

3* Sample and analyze coal waste material at the Cottonwood Waste Rock Site.

4* Sample and analyze the soil (Mancos) at the haul road site.

*Analyses will include the following parameters:

Texture (% sand, silt clay)
SAR (meq/l)
pH (standard units)
Ec (mmhos/cm)
Saturation Percentage (%)
Organic Carbon (%)
Total N (%)
Available Phosphorus (mg/Kg)
Available Potassium (mg/Kg)
Water Extractable Boron (mg/Kg)
Water Extractable Selenium (mg/Kg)
Acid-Base Potential
Available Water (%)
1/3 and 15 atmospheres
Soluble Ca, Mg and Na (meq/l)

5 Apply admixtures/or amendments to approximate conditions at natural vegetated mancos sites.

6 Incorporate adequate quantities of admixtures or amendments into top 12 to 18 inches of the mancos soil at the test plot sites to simulate soil conditions at natural vegetated mancos sites.

7 Sample and analyze test plot sites (per parameter list) to determine similarity with natural areas.

Following incorporation of admixtures and amendments at the test plots, contour ditches will be constructed across the entire test plot area. The ditches will be installed at 11 foot intervals from the top of the slope to the bottom. The ditches will completely retain the runoff at the test plot resulting from a 10 yr/6 hr storm event (see pages 31 and 32).

Following construction of the contour ditches the following seed mixture will be hand broadcast on the entire test plot. The seed will be covered by hand raking.

Agropyron dasystachyum	thickspike wheatgrass	3
A. smithii	western wheatgrass	4
Oryzopsis hymenoides	Indian ricegrass	3
Elymus cinereus	basin wildrye	4
Sporobolus airoides	alkali sakatoon	.25
Melilotus officinalis	yellow sweetclover	2

Linum lewisii	Lewis Flax	1
Sphaeralcea grossularifolia	globemallow	.5
Atriplex canescens	fourwing saltbush	2
A. corrugata	mat saltbush	2
A. confertifolia	shadscale	1
Ceratoides lanata	winterfat	2
Kochia prostrata	prostrata kochia	3
	Total (PLS/Acre)	25.25

Following seeding, the various mulch treatments will be applied as indicated on page 28.

A standard 4 wire field fence will be installed to protect the test plots from disturbance by livestock.

A rip-rap lined ditch and dirt berm will be installed along the crest of the slope above the test plot area. The ditch is sized to adequately carry runoff from a 10 yr/6 hr storm event (see pages 33 thru 38).

The test plots will be monitored as described in the Des Bee Dove Permit Application Package.

The present erosion monitoring program will continue at the four(4) established sites (see Map CM-10602-DS sheet 1 of 3). The current monitoring data seems to indicate gully development toward equalibrium at several sites similar to that discussed in BLM Technical Note 366. Data will be obtained from areas where naturally stable channels exist on slopes similar to the haul road slope. The geometric configuration of these natural channels will be determined and a comparison made between them and the erosion channels on the haul road slope.

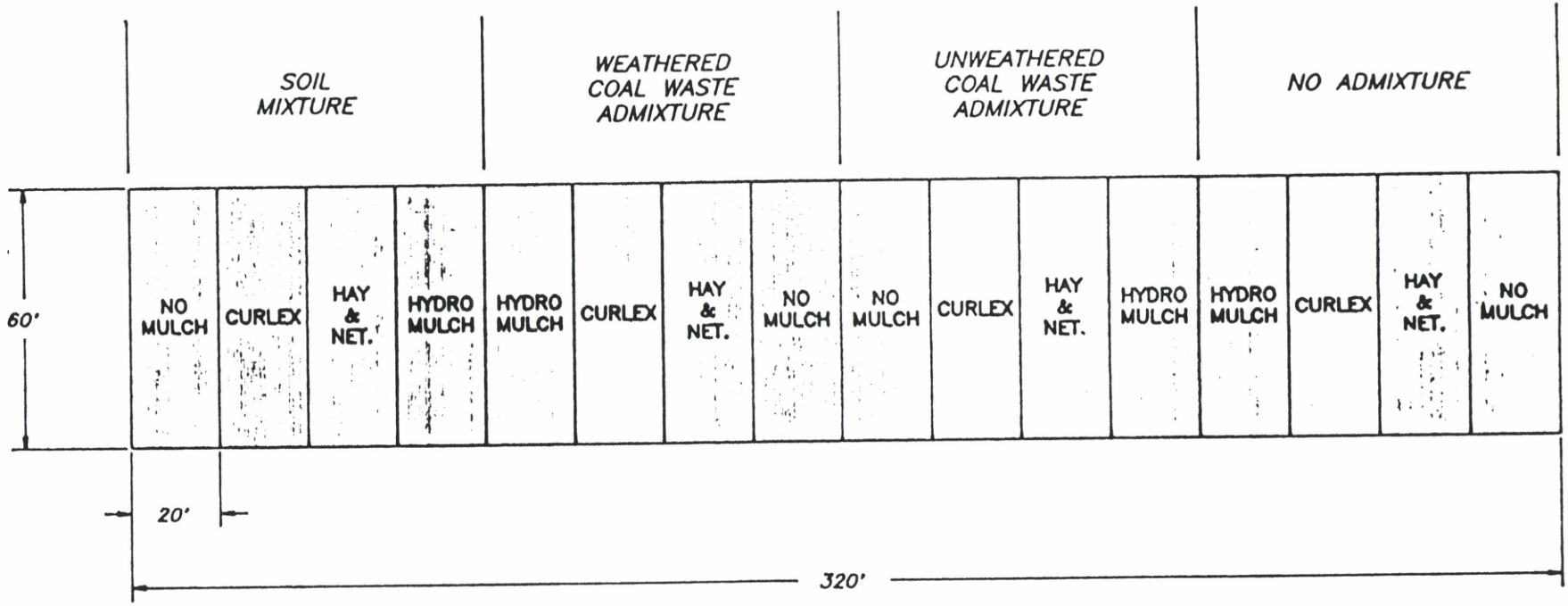
The feasibility of constructing a simulated natural channel at the sites of haul road erosion will be determined. Construction of such a channel may include the various gully control structures as discussed in USFS Research Paper RM-169, pages 12 thru 31. If feasible, construction of the down slope channel would include attempts to establish vegetation as a means of channel stabilization.

Technical information will continue to be collected as well as site specific monitoring data. All information will be used to evaluate the effectiveness of reclamation measures installed and to identify possible alternatives, if necessary, for final reclamation of the haul road.

Additionally, as stated in the Des Bee Dove PAP, vegetation test plots will be established at several additional fill slope sites along the haul road. These sites will provide information on the suitability of the fill material for final reclamation of the haul road in soils other than the mancos.

ADDITIONAL TEST PLOTS

DES–BEE–DOVE HAUL ROAD
RECLAMATION TEST PLOTS



CAD FILE NAME/DISK#: HAULRD KL7

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES DEPARTMENT
P.O. BOX 26128 SALT LAKE CITY, UTAH 84126–0128

DES–BEE–DOVE
HAUL ROAD RECLAMATION STUDY
VEGETATION TEST PLOTS

DRAWN BY: K. LARSEN	CS1284A
SCALE: 1"=40'	DRAWING #:
DATE: MARCH 5, 1991	SHEET 1 OF 1 REV.

DES BEE DOVE HAUL ROAD

HYDROLOGICAL ANALYSIS

Rainfall depth for a 10 yr/6 hr storm event was determined from US Dept. of Commerce, NOAA Atlas 2, 1973.

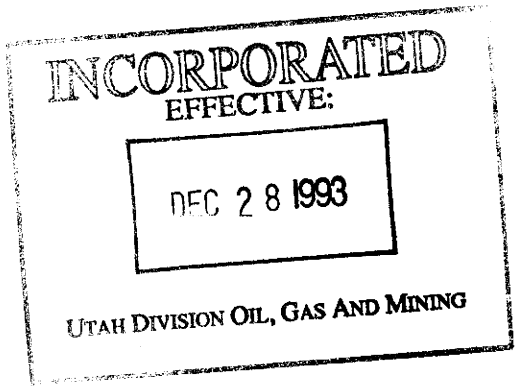
The rainfall-runoff relation for the test plot slope was determined as discussed in SCS National Engineering Handbook, 1972, Section 4, Hydrology, Chapter 10.

The peak runoff values for the riprapped crest ditch were calculated by use of the "Storm Hydrograph Program" by Richard H. Hawkins and Kim A. Marshall, September 1979, Utah State University Foundation. The drainage area was determined based on final reclamation topography of the haul road from Station 121+00 to 142+00.

The design of the crest ditch is based on Manning's equation for open channels. The design channel is a trapezoid shape with 1:2 side slopes and a 2 feet bottom width. The value for Manning's N for the rip-rap channel lining was taken from A Compliance Manual, Methods for Meeting OSM Requirements, by Skelly and Loy, 1979, page 7-16.

The channel capacity was determined as outline in Utah State DOT Manual of Instructions, Part 4 - Road Drainage, 1984, pages 3-22 and 3-32.

The rip-rap ditch lining design was based on the procedure in Applied Hydrology and Sedimentology for Disturbed Areas, by B.J. Barfield, R.C. Warner and C.T. Haan, Oklahoma Technical Press, 1981.



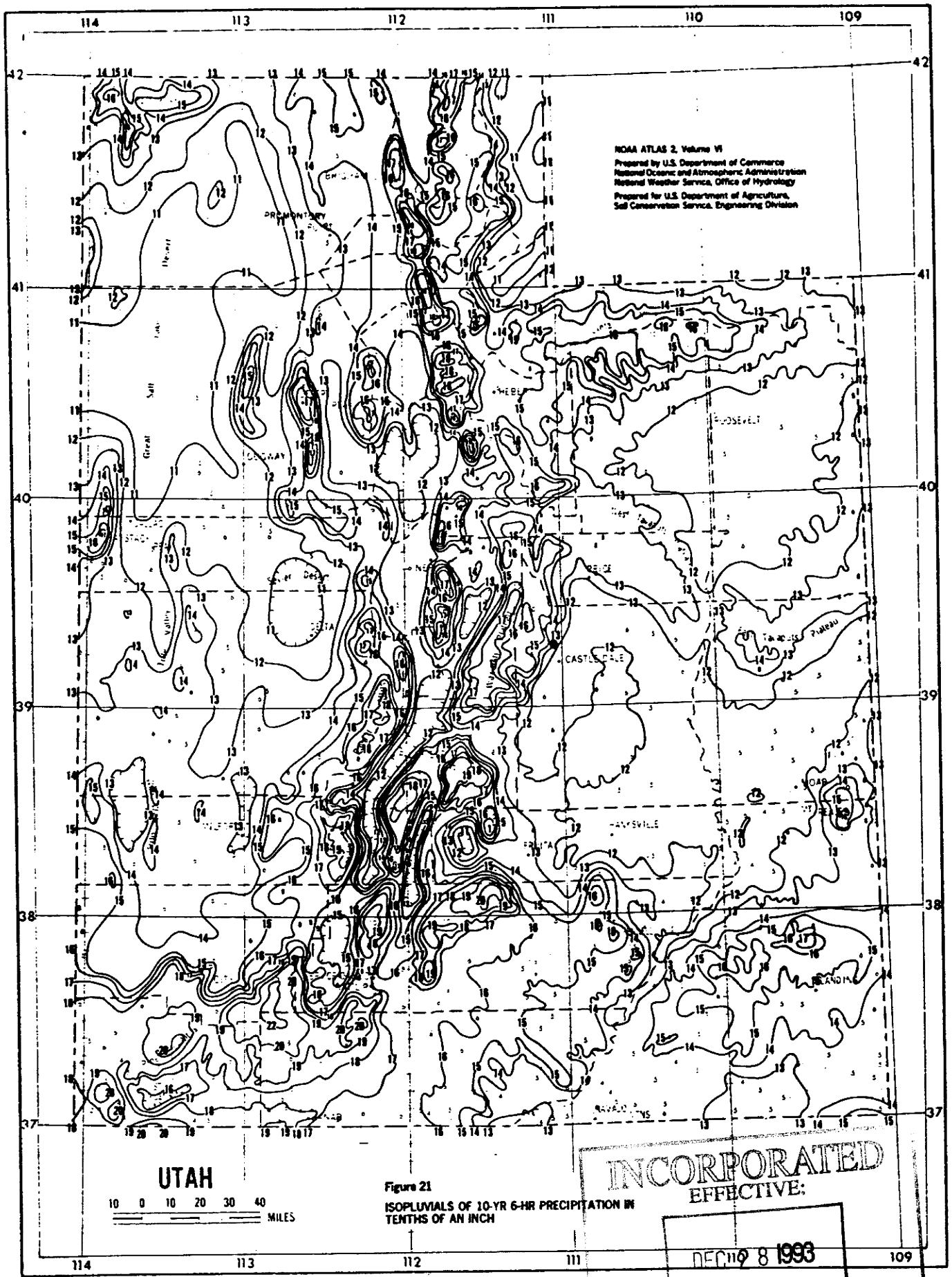


Figure 21

ISOPLUVIALS OF 10-YR 6-HR PRECIPITATION IN TENTHS OF AN INCH

DES BEE DOVE HAUL ROAD
STORM RUNOFF VALUES FOR 10 YEAR, 6 HOUR EVENT

RAINFALL DEPTH 1.3 INCHES

DISTRIBUTION: SOIL CONSERVATION SERVICE TYPE II

CN: 98

RAINFALL-RUNOFF RELATION, TEST PLOT SLOPE

$$Q = \frac{(P - 0.2\,S)^2}{P + 0.8\,S}$$

WHERE: $P = 1.3"$

$$S = \frac{1000}{CN} - 10 = .204$$

$$Q = \frac{(1.3 - 0.2\,(.204))^2}{1.3 + 0.8\,(.204)}$$

$Q = 1.09$ IN/FT^2

TEST PLOT AREA = 320' X 60' = 19,200 FT^2

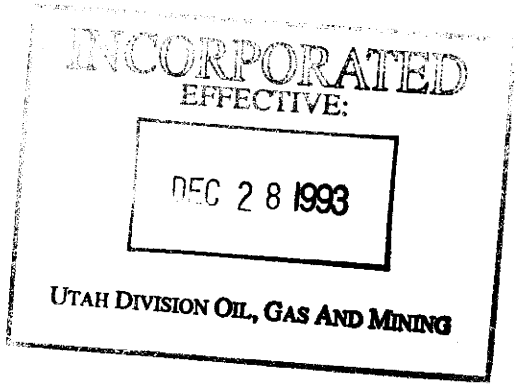
TOTAL RUNOFF = 1744 CU.FT.

CONTOUR DITCHES CAPACITY = 1 CU.FT./ 1 FT. LENGTH

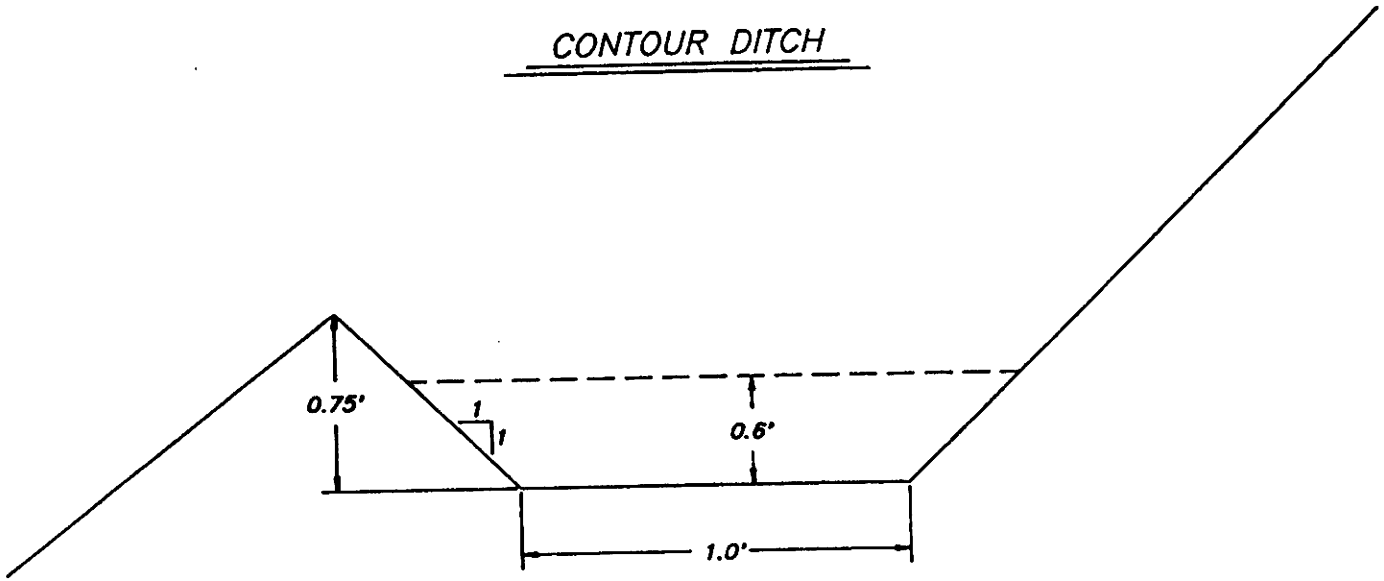
CAPACITY OF EACH DITCH = 320 CU.FT.

LENGTH OF SLOPE = 60 FT.

SPACING OF DITCHES = 11 FT.



CONTOUR DITCH



CAPACITY = 1 FT^3 PER LINEAR FT

CAD FILE NAME/DISK#: HAULRD XL7

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES DEPARTMENT
P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

DES-BEE-DOVE
HAUL ROAD RECLAMATION STUDY
CONTOUR DITCH - TYP. CROSS SECTION

DRAWN BY: K. LARSEN	CS1286A
SCALE: NONE	DRAWING #
DATE: MARCH 5, 1991	SHEET 1 OF 1 REV.

TABLE

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD
CREST DITCH

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 1.3 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .02 SQ. MILES
RUNOFF CURVE NO. = 98
TIME OF CONCENTRATION = .03 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.01	0.00	0.0000	0.0000	0.0000	0.00
0.01	0.00	0.0000	0.0000	0.0000	0.00
0.02	0.00	0.0000	0.0000	0.0000	0.00
0.02	0.00	0.0000	0.0000	0.0000	0.00
2.98	0.84	0.6347	0.0048	1.1955	15.43
2.99	0.84	0.6395	0.0048	1.1961	15.44
2.99	0.85	0.6443	0.0048	1.1966	15.44
3.00	0.85	0.6491	0.0048	1.1972	15.45
3.00	0.86	0.6539	0.0016	1.1977	15.46
3.00	0.86	0.6555	0.0016	1.1744	15.16
3.01	0.86	0.6571	0.0016	1.1271	14.55
3.01	0.86	0.6587	0.0016	1.0558	13.63
3.02	0.86	0.6603	0.0016	0.9605	12.40
3.02	0.87	0.6619	0.0016	0.8412	10.86
6.04	1.30	1.0836	0.0000	0.0036	0.05
6.04	1.30	1.0836	0.0000	0.0015	0.02
6.05	1.30	1.0836	0.0000	0.0003	0.00
6.05	1.30	1.0836	0.0000	0.0000	0.00
6.06	1.30	1.0836	0.0000	0.0000	0.00
6.06	1.30	1.0836	0.0000	0.0000	0.00
6.06	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.084 IN.
INITIAL ABSTRACTION = .041 IN.
PEAK FLOW = 15.503 CFS
TIME TO PEAK = 2.998 HOURS
RUNOFF VOLUME CHECK = 1.086 IN.

CREST DITCH CAPACITY CALCULATIONS

$$K' = \frac{Qn}{b^{8/3}\, s^{1/2}}$$

WHERE:

Q = 15.503 CFS
n = 0.0395 (Manning's n for rip-rap)
s = 0.08
b = 2'

K' = 0.302

FROM CHART (PAGE 36) - CAPACITY OF TRAPEZOIDAL CHANNEL

$\frac{d}{b} = .34$

d = b(d/b)

d = .68 ft.

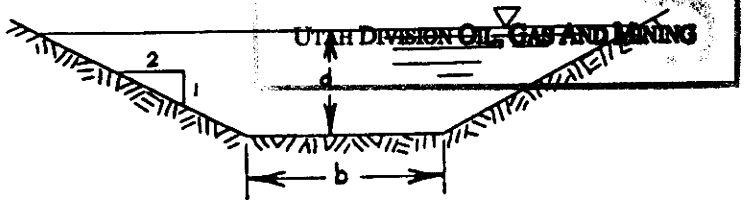
THEREFORE; CREST DITCH WILL CARRY THE PEAK RUNOFF OF 15.503 CFS WITH APPROXIMATELY 0.3' FREEBOARD.

A filter layer will be placed beneath the rip-rap channel lining materials. The filter will consist of 2 inch minus road base material and will be placed in a layer equal in thickness to the D_{50} size of the ditch.

VALUES OF $b^{8/3}$

b	$b^{8/3}$	b	$b^{8/3}$
1	1.00	21	3360
2	6.35	22	3800
3	18.7	23	4280
4	40.3	24	4790
5	73.1	25	5340
6	119	26	5930
7	179	27	6560
8	256	28	7230
9	350	29	7940
10	464	30	8690
11	598	31	9840
12	755	32	10320
13	934	33	11200
14	1140	34	12130
15	1370	35	13110
16	1630	36	14160
17	1910	37	15176
18	2230	38	16320
19	7940	39	17466
20	2950	40	18732

Table 3-22: TRAPEZOIDAL CHANNEL
2:1 SIDE SLOPES



1. Calculate $K' = \frac{Qn}{b^{8/3}s^{1/2}}$

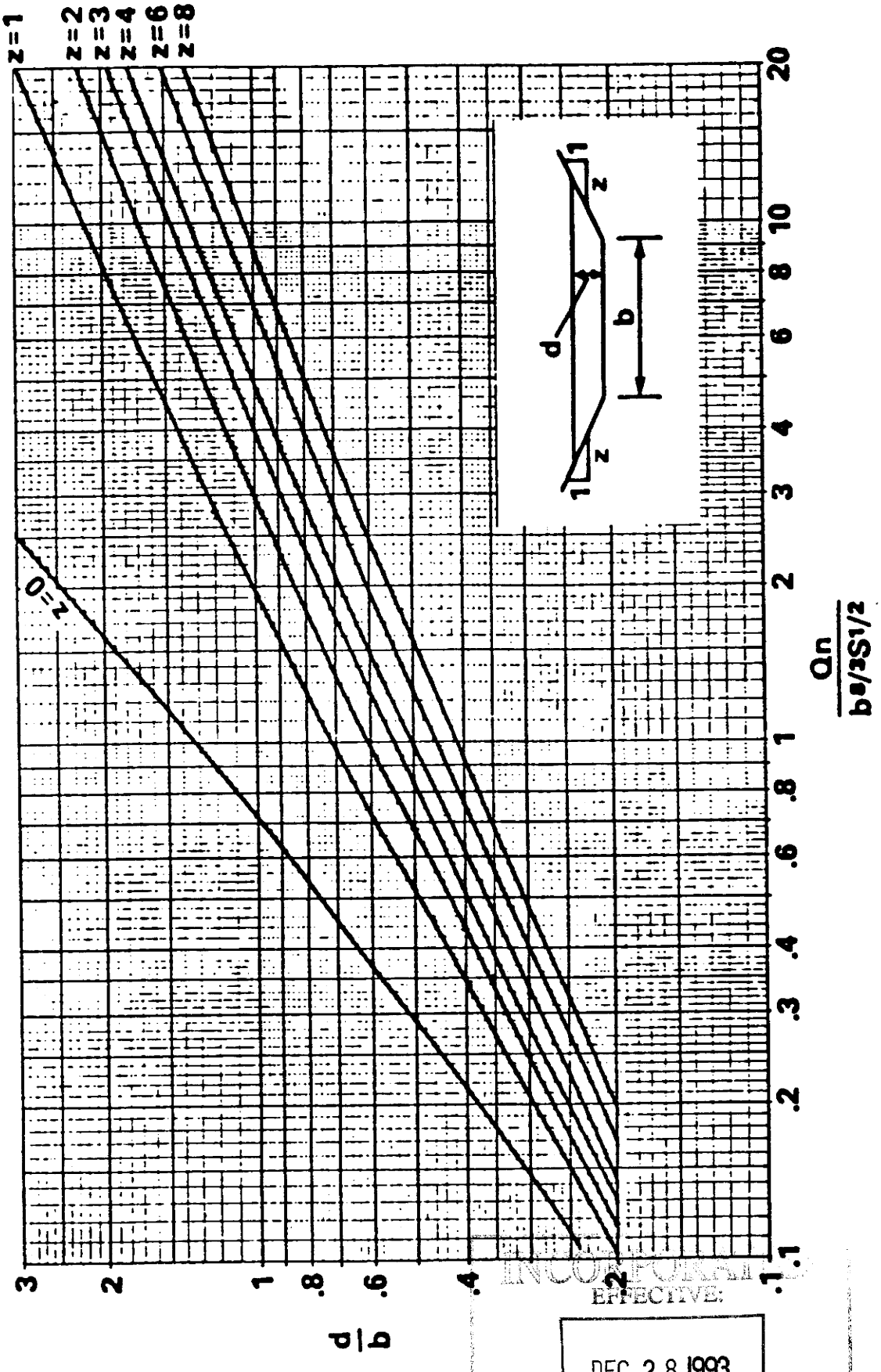
2. Enter the table below at K' and find the corresponding value of d/b.

3. Calculate d = b(d/b).

Values of K' as a function of the ratio d/b.

d/b	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.20	.116	.127	.139	.150	.163	.176	.189	.203	.217	.232
0.30	.248	.264	.281	.298	.316	.334	.353	.372	.392	.413
0.40	.434	.456	.478	.501	.525	.549	.574	.599	.625	.652
0.50	.679	.707	.736	.765	.795	.826	.857	.889	.922	.956
0.60	.990	1.02	1.06	1.10	1.13	1.17	1.21	1.25	1.29	1.33
0.70	1.37	1.41	1.46	1.50	1.54	1.59	1.63	1.68	1.73	1.78
0.80	1.83	1.88	1.93	1.98	2.03	2.08	2.14	2.19	2.25	2.31
0.90	2.36	2.42	2.48	2.54	2.60	2.66	2.73	2.79	2.85	2.92
1.00	2.99	3.05	3.12	3.19	3.26	3.33	3.40	3.48	3.55	3.62
1.10	3.70	3.78	3.85	3.93	4.01	4.09	4.17	4.25	4.34	4.42
1.20	4.51	4.59	4.68	4.77	4.86	4.95	5.04	5.13	5.22	5.32
1.30	5.41	5.51	5.61	5.71	5.81	5.91	6.01	6.11	6.21	6.32
1.40	6.42	6.53	6.64	6.75	6.86	6.97	7.09	7.20	7.31	7.43
1.50	7.54	7.66	7.78	7.90	8.02	8.15	8.27	8.40	8.52	8.65
1.60	8.78	8.91	9.04	9.17	9.30	9.44	9.57	9.71	9.85	9.99
1.70	10.1	10.3	10.4	10.6	10.7	10.8	11.0	11.1	11.3	11.4
1.80	11.6	11.7	11.9	12.1	12.2	12.4	12.5	12.7	12.9	13.0
1.90	13.2	13.4	13.5	13.7	13.9	14.0	14.2	14.4	14.6	14.7
2.00	14.9	15.1	15.3	15.5	15.6	15.8	16.0	16.2	16.4	16.6
2.10	16.8	17.0	17.2	17.4	17.6	17.8	18.0	18.2	18.4	18.6

Capacity of Trapezoidal Channel



R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

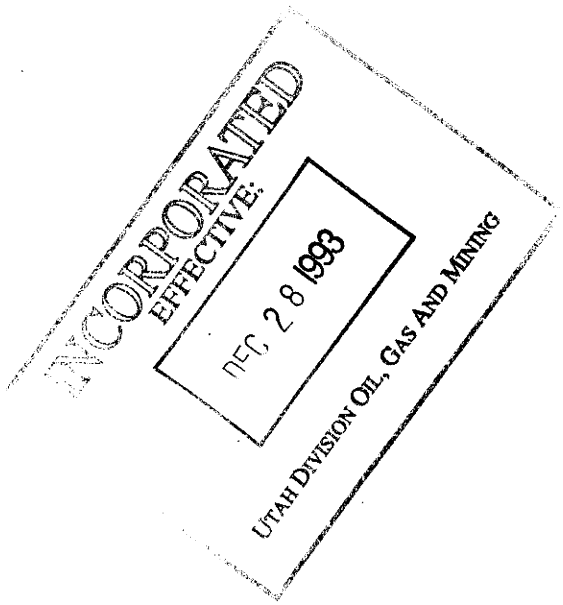
ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 15.503
2. CHANNEL SLOPE .08
3. BOTTOM WIDTH (FT) 2
4. SIDE SLOPE .5
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.0
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.04

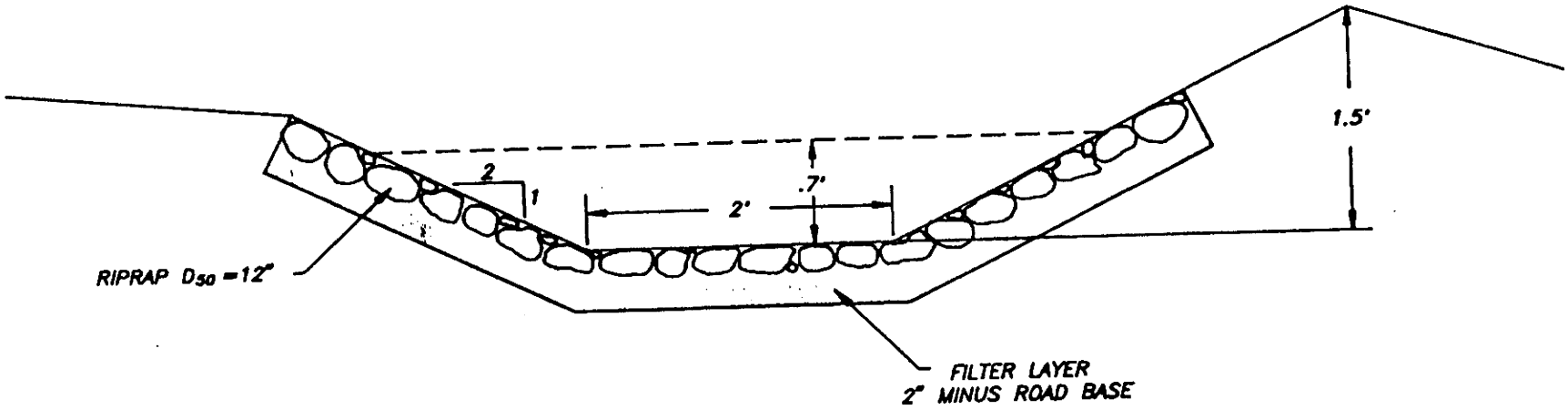
VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
6.427	.707	.9985	1.232	1.04

RUN COMPLETE

Ok



CREST DITCH & BERM



CAD FILE NAME/DISK#: HAULRD XL7

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES DEPARTMENT
P.O. BOX 26128 SALT LAKE CITY, UTAH 84126-0128

DES-BEE-DOVE
HAUL ROAD RECLAMATION STUDY
CREST DITCH & BERM

DRAWN BY:	K. LARSEN	CS1285A
SCALE:	NONE	DRAWING #
DATE:	MARCH 5, 1991	SHEET 1 OF 1 REV.

DES BEE DOVE EROSION TASK FORCE

AGENDA

DATE: November 12th and 13th, 1991 (1 1/2 Days)

LOCATION: PacifiCorp Training Center
1/4 Mile South of Huntington Airport

OBJECTIVE: TO RECEIVE WRITTEN CONSENSUS RECOMMENDATIONS FROM THE TASK FORCE. PACIFICORP MANAGEMENT WILL DEVELOP A PLAN TO SUBMIT TO DOGM FOR APPROVAL AND IMPLEMENTATION

PART I: TRAINING CENTER - NOVEMBER 12th - 9:00 - 11:30 AM

Overview of Problem and Objective - Guy Davis

Slide Presentation of Site History - Guy Davis

Study Results:

Erosion Studies - Val Payne and Guy Davis

Vegetation/Erosion Study - DOGM

Reclamation Study Overview - Val Payne

Test Plots - Val Payne and DOGM

Application to Interim Problem Solution - Guy Davis

BREAK: LUNCH AND TRAVEL TO MINE SITE 11:30 AM - 1:00 PM
(Lunch Provided by PacifiCorp)

PART II: FIELD SITE 1:00 - 3:00 PM

Problem Analysis -

Tentative Solutions -

PART III: TRAINING CENTER 3:30 - 5:00 PM

Consensus Recommendations -

Written Recommendations -

Final Statement -

PART IV: TRAINING CENTER - NOVEMBER 13TH - 9:00 - 11:30 AM

Time allocated if consensus and written recommendations are not met on November 12th timeframe.

PACIFICORP
ELECTRIC OPERATIONS

ONE UTAH CENTER

201 SOUTH MAIN • SUITE 2100 • SALT LAKE CITY, UTAH 84140-0021 • (801) 220-2000

DATE: November 7, 1991

TO: TASK FORCE MEMBER

FROM: Guy Davis - PacifiCorp Guy

SUBJECT: DES BEE DOVE EROSION TASK FORCE

Thank you for accepting this Task Force position. To help familiarize you with the area that the Task Force will be looking at, a brief history of what has occurred and future activities will be helpful.

A haul road was completed for the Des Bee Dove Mine in the Spring of 1983 which connected Highway 57 with the Danish Bench county road. The roadway was constructed for coal haulage from the mine to the Hunter Plant without going through the residential area of Orangeville.

Construction required the disturbance of the mancos shale to a large dugway which created cutslope and fillslope areas. This geologic formation (mancos shale) is very erodible with very limited revegetation capability.

Erosion in the fillslope areas has occurred in many locations. The larger erosion which is now present is the combination of 8 1/2 years of minor erosion and large > 10 yr/24 hr precipitation events. The first large event to this road area is recorded on 8-12-81 and caused erosion throughout the mine area particularly in this mancos location. Other violations were issued to the operator in following years concerning the erosion issue with abatement requirements met. The main abatement requirements were the establishment of the belt conveyor along the road guardrail, cut off ditches, installation of strawbale/silt fence filters on the pond access road and monitoring 4 locations at the crest of the main erosion site on May, July and September for width and depth measurements. Monitoring of the erosion sites are continuing. Seeding of the area was done in the fall of 1986 by the operator.

In the fall of 1989 a test plot area was located, on which a newly developed tackifier, soil additive and sulfur were applied along with seeding, in an attempt to reduce erosion and increase vegetation. The plots are still being monitored and conclusions are still pending.

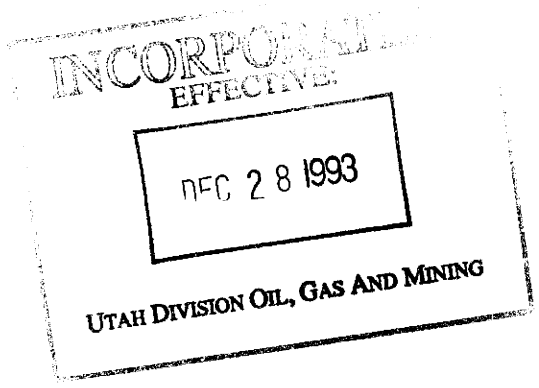
In the recent past, another violation has been issued to PacifiCorp for not controlling erosion on the location. Part of the abatement of this violation is to establish interim erosion control on the mancos area. Berming and waterbarring of the pad area just above the largest erosion area is being done at this time. This action will capture the runoff from

the pad for containment of a 10 yr/24 hr event. Plans for runoff control of another smaller area has been submitted to the Division of Oil, Gas and Mining.

FUTURE PLOTS

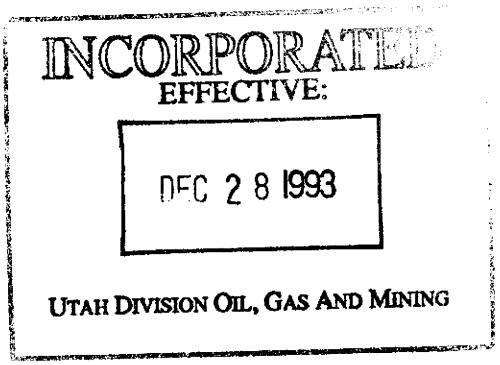
Future test plots are planned adjacent to the 1989 test plot area to help determine final reclamation methods. These plots will test several soil additives including sulfuric acid. Results of these plots may aid in interim soil stabilization. Feasibility of the study and other amendments to the study are in the process. Additional information and discussion of the proposed plots will be presented in the November 12th meeting.

If there are any questions, please call me at 653-2312.



Deo Bea Dove Meeting 11/12/91

Name	Agency
Bill Malencek	DOGM
Kenny Sauer	DOGM
George S. Cook	Soil Con. Service
Leland D Hansen	Soil Cons. Service
Susan White	DOGM
Ken Wyatt	DOGM
Val Payne	PacifiCorp
Dale Grange	Energy West
Dennis Oakley	Extension Service - Uint
Jess Kelley	DOGM
Guy Davis	PacifiCorp



PACIFICORP

ONE UTAH CENTER

201 SOUTH MAIN • SUITE 2100 • SALT LAKE CITY, UTAH 84140-0021 • (801) 220-2000

DATE: November 13, 1991

TO: Task Force Member

FROM: Guy Davis

SUBJECT: CONSENSUS RECOMMENDATIONS FROM NOVEMBER 12, 1991 MEETING AND FIELD VISIT

I am enclosing the notes which were taken at the afternoon session of the task force during our 11-12-91 meeting. These notes are what I understand to be the group consensus recommendations. If there are any comments to the stated recommendations, please call me at 653-2312.

CONSENSUS RECOMMENDATIONS:

1. Interim erosion has been minimized at the site by the recent berm and waterbar installation. The operator will continue to monitor the 4 erosion study locations at the crest of the slope area in May, July and September. In addition, photos of the slope will be taken annually at the bottom of the area during the fall of the year.

2. Test plots on the pad's recently disturbed berm and waterbars will be initiated in the fall of '92. Plots will be monitored annually by visual observation and photos. Soil testing will be done at the commencement and end of the plot schedule. Vegetative monitoring for density, cover and diversity will be done during the 3rd growing season. Vegetative productivity will be monitored at the end of the test plot schedule. Proposed treatments to the plots will be discussed and agreed upon by the operator and DOGM.

3. Future test plots on the outslope area will be considered after reviewing results of the '92 test plots on the pad area.

4. The disturbed pad area will be seeded in the fall of '91 with 30 pounds/acre of Annual ryegrass for further interim erosion control. No mulch or fertilizer will be applied.

5. Transplants for the '92 test plots will be discussed by the operator and DOGM. Probable planting in spring of '93.

6. **Native seed planting is a proposed plot treatment. If this treatment is agreed upon, the seed collecting must start in the summer of '92.**

DES-BEE-DOVE HAULROAD RECLAMATION STUDY
RUNOFF AND SEDIMENT YIELD MONITORING PROGRAM

The runoff and sediment yield monitoring program will consist of two phases. During the first phase, the development of the 1992 test plots (see map CM-10602-D5), staff gages will be installed in the trough areas within each type of application. Visual inspections will be made after precipitation events to document the effectiveness of the different types of applications. The second phase of the project will involve applying the applications based on the contoured ditched area to the proposed sloped test plot area. A total sediment collection will be installed to analyze the sediment yield from each type of application. Each type of application will be separated by a barrier of wood or metal to isolate each area. Runoff and sediment yield will be diverted to a collection system designed to accommodate a 10 year/24 hour precipitation event. Each collection system will consist of a container sized for a precipitation event of less than one inch and an overflow contained sized for a 10y/24h event. The following formulas will be utilized to determine the necessary volume once the size of the test plots has been determined.

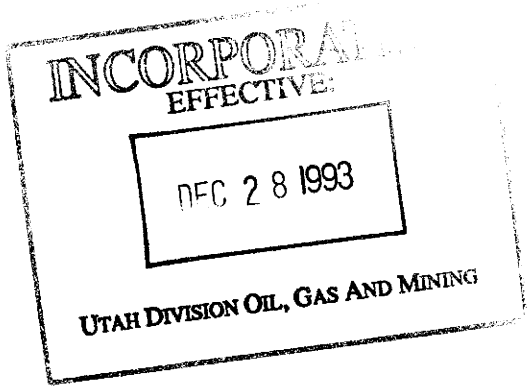
Total Runoff Volume Calculation:

Area = dependent on the number of applications
Curve Number = 89, Range, Poor, Soil Group D
Precipitation Event = 10y/24h, 2.0 inches

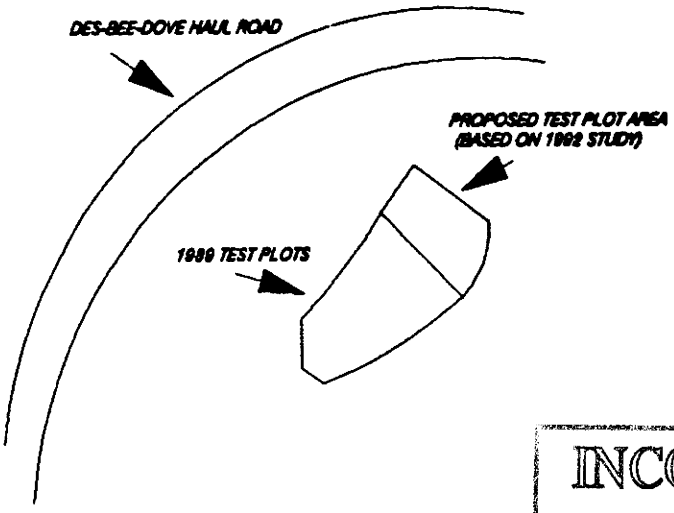
$S = (1000/CN) - 10$
$Q = (P - 0.2S)^2 / P + 0.8S$

S = Infiltration Depth
CN = Curve Number
Q = Runoff in inches, ft^2

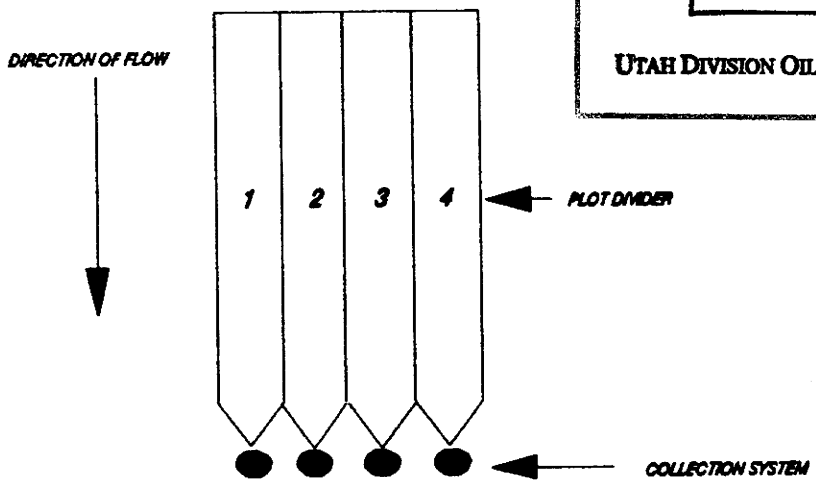
Precipitation will be monitored utilizing a recording rain gage and compared to the sediment yield from each type of application. Sediment yield from the test plots will be determined from dried weighing of samples. Since each application will be similar in nature, i.e. type of soil, slope, length, and area, direct comparisons of the sediment yield from each type of application can then be made along with comparisons to the precipitation events.



DES-BEE-DOVE HAULROAD RECLAMATION STUDY
RUNOFF AND SEDIMENT YIELD MONITORING PROGRAM
PROPOSED TEST PLOTS



CONCEPTUAL TEST PLOT CONFIGURATION



Sediment Collection System

Test plot dimensions will be based on the number of applications selected from the 1992 test plot study. By modifying designs used by Jackson[1], each test plot will be approximately 10 feet wide and approximately 100 feet long (the length will be dependent on the final site construction). Each plot will be divided-bordered by installing either boards or corrugated metal along the existing slope, approximately 1.5:1. A total sediment collection system will be designed to collect all the sediment and precipitation from a 10 year/24 hour event. Sediment and precipitation will be funneled to the collection system which will consist of two containers. The first container will be sized for precipitation events of 1.0 inch or less, the second for a 10 year/24 hour event. If a significant amount of sediment is collected in the first container, the total amount of sediment will be determined and compared to the amount of precipitation. If the storm event exceeds the first container, the overflow will collected in the second container and the amount of sediment will be determined calculating the total sediment solids in the runoff water.

[1] William L. Jackson, Karla Knoop, Joseph J. Szalona and Shirley Hudson, "A Runoff and Soil-loss Monitoring Technique Using Paried Plots," Technical Note 368, USDI Bureau of Land Management, Denver, CO, August, 1985

PACIFICORP

ONE UTAH CENTER

201 SOUTH MAIN • SUITE 2100 • SALT LAKE CITY, UTAH 84140-0021 • (801) 220-2000

June 12, 1992

Ms. Pamela Grubaugh-Littig
Permit Supervisor
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

RE: ADDITIONAL RESPONSE TO PERMIT CONDITIONS, DES BEE DOVE TEST PLOT PLAN, PACIFICORP, DES BEE DOVE MINE, ACT/015/017

Dear Ms. Grubaugh-Littig:

In response to your letter dated May 5, 1992, the attached Des Bee Dove Test Plots Plan - 1992 is submitted.

Upon approval this plan will be included at the end of Appendix XVI as an amendment.

If there are any questions, please call Guy Davis or me at 653-2312.

Sincerely,

Guy Davis

For Val Payne
Sr. Environmental Engineer

GD/dw
Enclosure

cc: J. Blake Webster
File

DES BEE DOVE TEST PLOT PLAN - 1992

INTRODUCTION

The focus of the 1992 Des Bee Dove Test Plots is primarily the Mancos shale. Specifically, to help develop reclamation procedures, plot treatments/soil admixtures will be tested to aid in the reclamation of the Mancos shale. Results from these 1992 test plots will determine the treatments to be tested on the "future" test plot planned in 3 to 5 years.

LOCATION

The individual plots will be approximately 10' x 14' each located in the raw Mancos material on top of the major fill slope between stations 131+00 to 142+00. The plots are part of the area redisturbed in the fall of 1991 as part of a violation abatement. (See attached Drawing CM-10874-DS.)

The location and size of the total plot area were based on the apparent universal soil and the availability of the test treatments. Each individual treatment will extend from the top of the waterbar slope to the top of the next waterbar slope (see Figure 1). All areas of the treatment, including the waterbars, will be observed and evaluated. The waterbar area is included because they are proposed in the final reclamation plan.

PLOT PREPARATION

All vegetation on the test plot area will be sprayed with two applications of Roundup two weeks prior to planting to kill any existing plant species. Applications will be spaced four (4) days apart.

PLOT TREATMENTS/ADMIXTURES

As a result of the May 15, 1992 meeting with Division representatives, the following treatments were agreed upon. All treatments will be done randomly on the plot location in triplication.

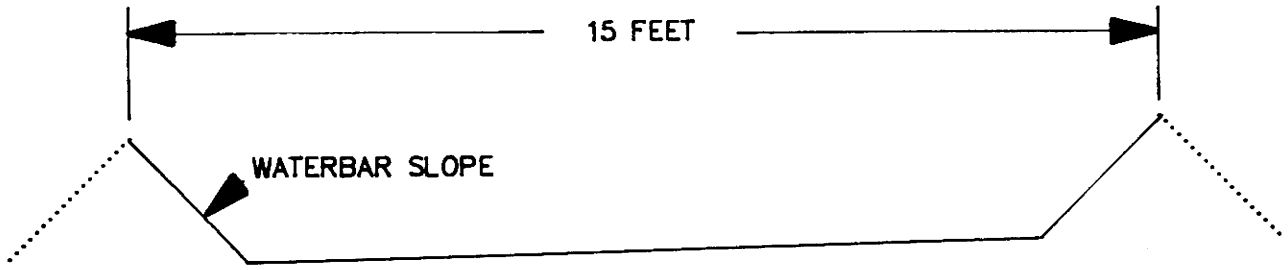
1. Rocky Soil (Native Soil)

   This soil will be borrowed from near the site and will be placed on top of the Mancos soil. It is anticipated that one cubic yard of rocky soil will be used per individual plot. This will cover the Mancos surface with 2" or greater of soil. The treatment of rocky soil will be similar to the natural surrounding areas, so volume may vary following native soil sample results.

FIGURE 1

DES BEE DOVE TEST PLOTS – 1992

CROSS–SECTION



* NO SCALE

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2. Coal Waste

Refuse waste <2" will be placed on top of the Mancos. On cubic yard of material will be required to cover one plot with 2" of refuse.

3. Live Earth

A soil admixture called "Live Earth" will be applied to the top of the Mancos material at 1200 lbs/acre. Application of this admixture will be done by Keith Littlefield, a supplier of the product. It is anticipated that addition will lower high pH and sulfate concentrations typical of the Mancos. The "Live Earth" will be applied in a dry form.

4. Combination Of Rocky Soil And "Live Earth"

This combination admixture will consist of 1 cubic yard of native rocky soil placed on top of 800 lbs/acre "Live Earth" product. The "Live Earth" may be applied in either the dry or liquid form per supplier preference. "Live Earth" representative will aide in the plot treatments application.

5. Combination Of Refuse Waste And "Live Earth"

This combination admixture will consist of 1 cubic yard/plot of less than 2" waste coal material placed on top of 800 lbs/acre "Live Earth" product. The "Live Earth" may be applied in either the dry or liquid form per the representative's preference. "Live Earth" representative will aide in the plot treatments application.

6. Sewage Treatment Plant Sludge

Sewage Treatment Plant sludge will be used as a treatment only if approved by the State Division of Water Pollution and Solid and Hazardous Waste. This approval will be obtained by Division personnel. Treatment volume will be determined after approval is received.

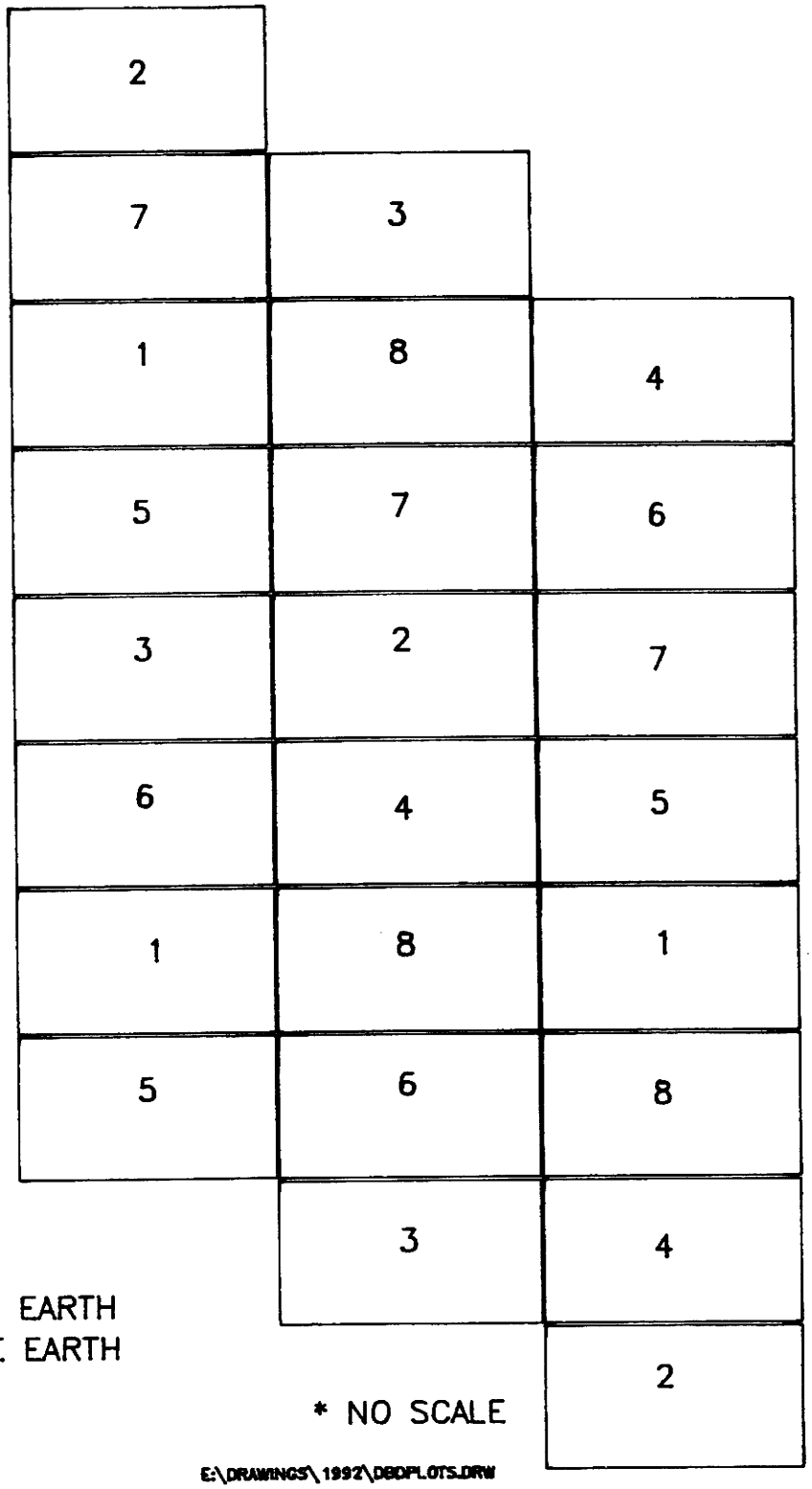
7. Native Seed

Native seed from the adjacent area will be collected and applied to 3 test plots. The seed mixture will be tested for viability prior to seeding. The quantity and variety of seed will be determined by availability at time of collection (see Figure 2).

It is anticipated that the following seed could be available at undetermined quantities:

FIGURE 2
DES BEE DOVE TEST PLOTS – 1992

PLOT TREATMENTS/ADMIXTURES



LEGEND

1. ROCKY SOIL
2. COAL WASTE
3. LIVE EARTH
4. ROCKY SOIL AND LIVE EARTH
5. COAL WASTE AND LIVE EARTH
6. SEWAGE SLUDGE
7. NATIVE SEED
8. NURSERY SEED

* NO SCALE

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COMMON NAME	SCIENTIFIC NAME	COLLECTION
Fourwing Saltbush	Atriplex canescens	Mid Oct.- Nov.
Shadscale	A. confertifolia	Mid Oct. - Nov.
Cuneate Saltbush	A. cuneata	Mid July - Aug.
Greasewood	Sarcobatus vermiculatus	October
Fat-hen Saltbush	Atriplex patula	June
Corymbed Eriogonum	Eriogonum corymbosum	Mid Aug - Sept.
Rock Goldenrod	Petradoria pamila	June
Salina Wildrye	Elymus salinus	Mid June
Squirreltail	Sitanion hystrix	June
Indian Ricegrass	Oryzopsis hymenoides	Late June
Mormon Tea	Ephedra viridis	Mid July
Prince's Plume	Stanleya pinnate	Mid June
Rabbit brush	Chrysothamnus nauseosus	Mid Oct. - Nov.

8. Nursery Seed

Nursery seed will be planted in 3 plots for comparison to the native seed plots. Nursery seed will also be seed source for all other treatments/admixtures. The seed mixture and planting amounts will be the approved final seedmix of the permit.

COMMON NAME	SCIENTIFIC NAME	LBS/ACRE PLS
Thickspike wheatgrass	Agropyron dasystachyum	3
Western wheatgrass	A. smithii	4
Indian ricegrass	Oryzopsis hymenoides	3
Basin wildrye	Elymus cinereus	4
Alkali sakatoon	Sporobolus airoides	.25
Yellow sweetclover	Melilotus officinalis	2
Lewis flax	Linum lewisii	1
Globemallow	Sphaeralcea grossularifolia	.5
Fourwing Saltbush	Atriplex canescens	2
Mat Saltbush	A. corrugata	2
Shadscale	A. confertifolia	1

Winterfat	Ceratoides lanata	2
Prostrate Kochia	Kochia prostrata	.5
TOTAL		25.25

Random treatment locations are shown on Figure 2. Each treatment will be staked and identified by a surveyor stake at each corner.

SOIL TESTING

Initially, the general test plot area will be sampled for the following parameters at 3 random locations. The sampling locations will be marked by a roofbolt for future identification.

Texture (% sand, silt clay)
SAR (meq/l)
pH (standard units)
Electrical Conductivity (mmhos/cm)
Saturation (%)
Organic Carbon (%)
Total N (%)
Available Phosphorus (mg/kg)
Available Potassium (mg/kg)
Water Extractable Boron (mg/kg)
Water Extractable Selenium (mg/kg)
Acid Base Potential
Available Water (%)
1/3 and 15 atmospheres
Soluble Ca, Mg, Na (meq/l)

At the end of the test plot observation period (3 to 5 years) soil samples from each of the individual plots will be taken and analyzed for the same parameters. Three of these locations, will be the same locations as the initial soil sample locations.

SURFACE POCKING

The entire test plot area will be pocked by mechanical device or hand tools after the admixtures have been applied but prior to any seeding. The pocking will be randomly spaced over the entire area of each plot including the waterbar slopes.

SEEDING

All seeding will take place in the late fall, after the native seed collecting is complete. All plots will be seeded by hand broadcasting after the surface has been pocked. The seed will be lightly covered by dragging a chain between two workers.

MULCHING

All treatments/admixtures will be covered with curlex blanket. The blanket will be anchored as recommended by the manufacturer.

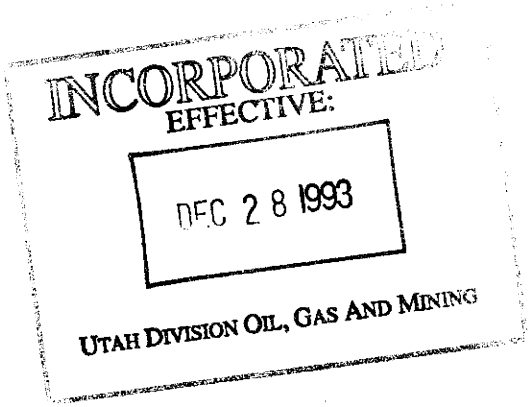
FERTILIZER

No fertilizer will be added initially because of the inherent high salt content of the Mancos. Fertilizer application may be considered in subsequent years.

MONITORING

Plots will be monitored annually by visual observation and photos. Vegetative monitoring for density, cover and diversity will be done during the 3rd growing season. Vegetative productivity will be monitored at the end of the test plot schedule.

Soil testing will be done at the commencement and end of the plots observation period. (See Soil Testing.)



One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021
(801) 220-2000

PACIFICORP
POWER SUPPLY

September 25, 1992

Ms. Pamela Grubaugh-Littig
Permit Supervisor
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

RE: DES BEE DOVE TEST PLOT PLAN, ADDITIONAL COMMITMENTS, PACIFICORP, DES BEE DOVE MINE, ACT/015/017

Dear Pamela:

In response to your letter of September 2, 1992, concerning two additional commitments required by the Division for submittal into Appendix XVI of the permit, PacifiCorp submits the following:

COMMITMENT 1 A commitment to analyze "live earth" and the borrow soil.

PacifiCorp commits to obtain the analytical results of the product "live earth" from the supplier if such information is not deemed proprietary by the supplier. The product has been tested extensively by the supplier in its use on farmlands.

The borrow soil will be sampled and analyzed for the listed parameters of Appendix XVI "Des Bee Dove Test Plot Plan - 1992"

COMMITMENT 2 *A description of the soil borrow area, including* locations.

The borrow soil will be from the existing Cell #7 of the old Waste Rock Facility. When the cell is covered for final reclamation this fall, a small amount for the Des Bee Dove Test Plot will be borrowed. The soil is similar to the Native Soil which blankets over the Mancos near the test plot area.

Please include this letter at the end of Appendix XVI and replace the Appendix XVI Summary with the enclosed revised Summary.

If there are any questions, please call.

Sincerely,

Val Payne
Sr. Environmental Engineer

Enclosure

cc: J. Blake Webster
File

A:DBDTEST.PLT

One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021
(801) 220-2000

PACIFICORP
POWER SUPPLY

February 4, 1993

Ms. Pamela Grubaugh-Littig
Permit Supervisor
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

RE: SUBMITTAL OF TEST PLOT DRAWING AND PROCEDURES, PACIFICORP, DES BEE DOVE MINE, ACT/015/017

Dear Pamela,

In response to your January 20, 1993 letter, we submit the following amendment.

The installation of the test plots was completed on November 9, 1992. The original Test Plot Plan - 1992, submitted to the Division on 6-12-92, was followed with the exception of the deletion of the sewage sludge admixture and the treatment of 1,000 lbs/acre to all "Live Earth" admixture plots instead of the varied 1,200 to 800 lbs/acre. These changes are reflected in the added Figure 2 "as-built" drawing and the Plot Installation 11-9-92.

Upon approval, please add this letter along with the above referenced pages to the end of Appendix XVI of the permit. Also, please replace the Summary at the beginning of Appendix XVI with the revised Summary reflecting this amendment addition.

If there are any questions, please call Guy Davis or me at 653-2312.

Sincerely,

Val E. Payne
Sr. Environmental Engineer

Enclosures

cc: Steve Kochevar
J. Blake Webster

A\DBDTPINS.AMD

DES BEE DOVE TEST PLOT - 1992

PLOT INSTALLATION 11-9-92

1. **Soil Sampling**
   - The test plot area was sampled at 3 locations and analyzed for the approved parameters. The locations were marked for further reference by a roof bolt.
   - The Rocky Soil was sampled and analyzed for the same parameters.
   - All soil samples were taken on 9-30-92

2. **Plot Preparation**
   - The plots were roughened by a backhoe the week of Nov. 2nd.
   - The plots were left with pocking to enhance local water retention.
   - Disturbance was thorough to remove perennial roots which might be still alive

3. **Admixture Implementation**
   - Approximately 1 cubic yard of Coal Waste material was raked evenly over plots 2 and 5.
   - Approximately 1 cubic yard of Rocky Soil was raked evenly over plots 1 and 4.
   - 10 lbs. (1,000 lbs/acre) of "Live Earth" was placed on plots 3,4 and 5 by a broadcasting with a hurricane spreader.
   - The Sewage Sludge was not applied to plot 6 because of no application approval from the Divisions within the Department of Environmental Quality.

4. **Seeding**
   - The approved Nursery Seedmix was broadcast over all plots (including plot 6), with the exception of plot 7.
   - The collected Native Seedmix was broadcast over plot 7. (PLS of the native seedmix/plot matched the nursery seedmix/plot)
   - The entire plot area was hand raked to incorporate the seed into the soil.

5. **Mulching**
   - Curlex Blanket was placed on top to the surface of all plots. The blanket was installed according to manufacturer's recommendations.

A:DBDTPINS.LET

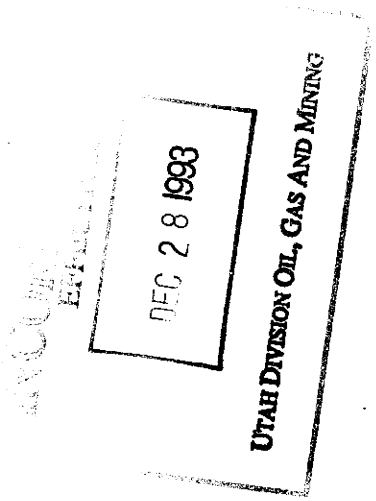
FIGURE 2

DES BEE DOVE TEST PLOTS - 1992

PLOT TREATMENTS/ADMIXTURES AS - BUILT

2	14' VARIES	
7	3	10' VARIES
1	8	4
5	7	* 6 (8)
3	2	7
* 6 (8)	4	5
1	8	1
5	* 6 (8)	8
	3	4
		2

* PLOT #6 WERE NOT APPROVED BY STATE AGENCIES. THESE PLOTS WERE TREATED WITH TREATMENT #8 ONLY



LEGEND

1. ROCKY SOIL
2. COAL WASTE
3. LIVE EARTH
4. ROCKY SOIL AND LIVE EARTH
5. COAL WASTE AND LIVE EARTH
6. SEWAGE SLUDGE *
7. NATIVE SEED
8. NURSERY SEED

NO SCALE

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201 South Main, Suite 2100
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(801) 220-2000

PACIFICORP
POWER SUPPLY

March 26, 1993

Ms. Pamela Grubaugh-Littig
Permit Supervisor
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

RE: DEFICIENCIES FOR AS-BUILT TEST PLOT, APPENDIX XVI, DES-BEE-DOVE MINE, PACIFICORP, ACT/015/017

Dear Pamela,

In response to your letter of February 22, 1993 (copy attached), the following information is submitted to answer the four stated deficiencies. Upon approval, the following material should be added to Appendix XVI, located in Vol. 7 of the permit. Please replace the current Appendix XVI Summary with the revised 3/36/93 Summary.

Deficiency #2 of the 2/22/93 letter asked for seed source information of the Nursery Seedmix which was not included in the seed tag attached to the seed bag. In reviewing the attached pages 96 and 97 of the "Seed Act" the seed supplier is not required to supply all of the information requested by the Division. Included in this submittal is a copy of the seed tag which was attached to the nursery seedmix. It appears to be in accordance with the "Act".

PacifiCorp commits to provide the Division with future test plot soil laboratory results. More sampling is committed to in 3 to 5 years per the "Test Plot Plan - 1992.

If you have any questions, please call Guy Davis or me at 653-2312.

Sincerely,

Val E. Payne
Sr. Environmental Engineer

cc. Steve Kochevar
J. Blake Webster

A\DBDTPDEF.AMD

PURE LIVE SEED (PLS) DETERMINATION

DES BEE DOVE MINE TEST PLOT - NATIVE SEED

NURSERY SEEDMIX PLS LBS/ACRE REQUIREMENT

	Indian Ricegrass	3 lbs/acre
*	Salina Wildrye	4 "
	Fourwing Saltbush	2 "
	Mat Saltbush	2 "
	Shadscale	1 "
	Total	12 lbs/acre

Other species are included in the nursery seedmix but they were not collectable in the nearby mancos area.

* Salina Wildrye is not a species included in the nursery seedmix. The 4 lbs. was determined by matching the maximum grass species poundage of the nursery seedmix.

NATIVE SEED TEST PLOT ACREAGE

- 3 separate plots of 10'X 14' = .01 acres
- .12 lbs. PLS of the Native Seedmix is required

NATIVE SEED PURE LIVE SEED (PLS)

	Purity Test	Germination Test	PLS
Indian Ricegrass	90%	88%	79%
Salina Wildrye	60%	81%	49%
Fourwing Saltbush	95%	36%	34%
Mat Saltbush	84%	44%	37%
Shadscale	75%	29%	22%

PLS/ACRE (LBS REQUIRED/PLS%)

Indian Ricegrass	3.8 lbs/acre
Salina Wildrye	8.2 "
Fourwing Saltbush	5.9 "
Mat Saltbush	5.4 "
Shadscale	4.5 "

PLS LBS FOR 3 PLOTS (PLS/acre X .01 acres)

Indian Ricegrass	.04 lbs.	18.2 g.
Salina Wildrye	.08 lbs.	36.3 g.
Fourwing Saltbush	.06 lbs.	27.2 g.
Mat Saltbush	.05 lbs.	22.7 g.
Shadscale	.05 lbs.	22.7 g.

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APPENDIX XVI
ADDED 3/26/93

PURE SEED TESTING
DES BEE DOVE TEST PLOT NATIVE SEED
10/10/92

1. Indian Ricegrass — Oryzopsis hymenoides

SAMPLE:	7 gm
SEED/LITTER, ETC:	6.3 gm/.7 gm (No Foreign Seed Found)
PURE SEED:	90%

2. Salina Wildrye — Elymus salinus

SAMPLE:	7 gm
SEED/LITTER, ETC:	4.2 gm/2.8 gm (No Foreign Seed Found)
PURE SEED:	60%

3. Fourwing Saltbush — Atriplex canescens

SAMPLE:	19 gm
SEED/LITTER, ETC:	18.1 gm/.9 gm (No Foreign Seed Found)
PURE SEED:	95%

4. Mat Saltbush — Atriplex corrugata

SAMPLE:	8 gm
SEED/LITTER, ETC:	6.7 gm/1.3 gm (No Foreign Seed Found)
PURE SEED:	84%

5. Shadscale — A. confertifolia

SAMPLE:	20 gm
SEED/LITTER, ETC:	14.9 gm/5.1 gm (No Foreign Seed Found)
PURE SEED:	75%

APPENDIX XVI
ADDED 3/26/93

SEED ANALYSIS REPORT

UTAH STATE DEPARTMENT OF AGRICULTURE

DIVISION OF PLANT INDUSTRY
SEED LABORATORY, 350 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116

[redacted] 1818

GERMINATION FEE
OTHER TX $0.00
TOTAL FEE $ 20.00

Nov. 9, 19 92

SAMPLE SUBMITTED BY:

NAME Energy West Mining Guy Davis ADDRESS Box 1005 Huntington, UT 84528

BAGS _____ POUNDS _____ CERTIFICATION NO _____

KIND AND VARIETY *	LOT NO.	PURE SEED %	OTHER CROP %	INERT MATTER %	WEED SEED %	Germination %	HARD** SEED %	Germ & Hard Seed%	GRADE
Indian Ricegrass						98.00 viable by TZ			

PURE SEED INCLUDES ALL SEED OF THE KIND BEING EXAMINED. CROP SEED CONTAINS SEEDS OF OTHER CULTIVATED PLANTS. INERT MATERIAL INCLUDES BROKEN SEED, DIRT, STICKS, CHAFF, CHALCID-FLY INFESTED SEED, AND SIMILAR MATERIAL.

*VARIETY DESIGNATIONS NOT CONFIRMED BY LABORATORY.

**RE: HARD SEEDS: ACTUAL PERCENT OF HARD SEED AND THE ACTUAL PERCENT OF GERMINATION MUST BE LISTED. IT IS NOT PERMISSIBLE TO COMBINE THESE PERCENTAGES UNDER GERMINATION.

FOREIGN SEED INCLUDES THE FOLLOWING

NOXIOUS WEED SEEDS	NO. PER POUND	OTHER WEED SEEDS	NO. PER POUND	OTHER CROP SEEDS	NO. PER POUND

INCORPORATED
EFFECTIVE:
DEC 28 1993
UTAH DIVISION OIL, GAS AND MINING

REMARKS:

APPENDIX XVI
ADDED 3/26/93

CC: CARL BOTT

DATE SAMPLE RECEIVED BY LABORATORY
10-28-92

SAMPLE TREATED
YES ☐ NO ☒

Terry Sue Freeman TSF
STATE SEED ANALYST

THIS SEED TEST REPORT APPLIES ONLY TO THE SAMPLES SUBMITTED. SAMPLES SHOULD BE REPRESENTATIVE OF THE LOTS FROM WHICH THEY ARE TAKEN. THE SEED LABORATORY DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE SAMPLING, UNLESS THE SAMPLE IS TAKEN BY AN AUTHORIZED EMPLOYEE OF THE UTAH STATE DEPARTMENT OF AGRICULTURE. IN REFERRING TO SAMPLES PLEASE GIVE LABORATORY TEST NUMBER.

AG 420 (3/92)

SEED ANALYSIS REPORT
UTAH STATE DEPARTMENT OF AGRICULTURE

DIVISION OF PLANT INDUSTRY
SEED LABORATORY, 350 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116

Nov. 9, 19 92

817

PURITY FEE
GERMINATION FEE $ 30.00
OTHER
TOTAL FEE $ 30.00

SAMPLE SUBMITTED BY:

NAME Energy West Mining Guy Davis ADDRESS Box 1005 Huntington,UT 84528

BAGS _____ POUNDS _____ CERTIFICATION NO _____

KIND AND VARIETY *	LOT NO.	PURE SEED %	OTHER CROP %	INERT MATTER %	WEED SEED %	Germination %	HARD** SEED %	Germ & Hard Seed%	GRADE
Salina Wildrye						81.00	viable by TZ		

PURE SEED INCLUDES ALL SEED OF THE KIND BEING EXAMINED. CROP SEED CONTAINS SEEDS OF OTHER CULTIVATED PLANTS. INERT MATERIAL INCLUDES BROKEN SEED, DIRT, STICKS, CHAFF, CHALCID-FLY INFESTED SEED, AND SIMILAR MATERIAL.

*VARIETY DESIGNATIONS NOT CONFIRMED BY LABORATORY.

**RE: HARD SEEDS: ACTUAL PERCENT OF HARD SEED AND THE ACTUAL PERCENT OF GERMINATION MUST BE LISTED. IT IS NOT PERMISSIBLE TO COMBINE THESE PERCENTAGES UNDER GERMINATION.

FOREIGN SEED INCLUDES THE FOLLOWING

NOXIOUS WEED SEEDS	NO. PER POUND	OTHER WEED SEEDS	NO. PER POUND	OTHER CROP SEEDS	NO. PER POUND

INCORPORATED
EFFECTIVE:
DEC 28 1993
UTAH DIVISION OIL, GAS AND MINING

REMARKS:

APPENDIX XVI
ADDED 3/26/93

USI: CARL BOTT

DATE SAMPLE RECEIVED BY LABORATORY
10-28-92

SAMPLE TREATED
YES ☐ NO ☒

Terry Sue Freeman
STATE SEED ANALYST

74

THIS SEED TEST REPORT APPLIES ONLY TO THE SAMPLES SUBMITTED. SAMPLES SHOULD BE REPRESENTATIVE OF THE LOTS FROM WHICH THEY ARE TAKEN. THE SEED LABORATORY DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE SAMPLING, UNLESS THE SAMPLE IS TAKEN BY AN AUTHORIZED EMPLOYEE OF THE UTAH STATE DEPARTMENT OF AGRICULTURE. IN REFERRING TO SAMPLES PLEASE GIVE LABORATORY TEST NUMBER.

SEED ANALYSIS REPORT

1814

UTAH STATE DEPARTMENT OF AGRICULTURE
DIVISION OF PLANT INDUSTRY
SEED LABORATORY, 350 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116

PURITY FEE _____
GERMINATION FEE _____
OTHER $ 20.00
TOTAL FEE $ 20.00

Nov. 9, 19 92

SAMPLE SUBMITTED BY:

NAME Energy West Mining ADDRESS Box 1005 Huntington, UT 84528

BAGS _____ POUNDS _____ CERTIFICATION NO _____

KIND AND VARIETY *	LOT NO.	PURE SEED %	OTHER CROP %	INERT MATTER %	WEED SEED %	Germination %	HARD** SEED %	Germ & Hard Seed%	GRADE
Fourwing Saltbush						36.00 viable by TZ			

PURE SEED INCLUDES ALL SEED OF THE KIND BEING EXAMINED. CROP SEED CONTAINS SEEDS OF OTHER CULTIVATED PLANTS. INERT MATERIAL INCLUDES BROKEN SEED, DIRT, STICKS, CHAFF, CHALCID-FLY INFESTED SEED, AND SIMILAR MATERIAL.

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**RE: HARD SEEDS: ACTUAL PERCENT OF HARD SEED AND THE ACTUAL PERCENT OF GERMINATION MUST BE LISTED. IT IS NOT PERMISSIBLE TO COMBINE THESE PERCENTAGES UNDER GERMINATION.

FOREIGN SEED INCLUDES THE FOLLOWING

NOXIOUS WEED SEEDS	NO. PER POUND	OTHER WEED SEEDS	NO. PER POUND	OTHER CROP SEEDS	NO. PER POUND

REMARKS:

APPENDIX XVI
ADDED 3/26/93

TEST: CARL BOTT

DATE SAMPLE RECEIVED BY LABORATORY
10-28-92

SAMPLE TREATED
YES ☐ NO ☒

Terry Sue Freeman TSF
STATE SEED ANALYST

75

THIS SEED TEST REPORT APPLIES ONLY TO THE SAMPLES SUBMITTED. SAMPLES SHOULD BE REPRESENTATIVE OF THE LOTS FROM WHICH THEY ARE TAKEN. THE SEED LABORATORY DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE SAMPLING, UNLESS THE SAMPLE IS TAKEN BY AN AUTHORIZED EMPLOYEE OF THE UTAH STATE DEPARTMENT OF AGRICULTURE. IN REFERRING TO SAMPLES PLEASE GIVE LABORATORY TEST NUMBER.

AG 420 (3/92)

SEED ANALYSIS REPORT

UTAH STATE DEPARTMENT OF AGRICULTURE
DIVISION OF PLANT INDUSTRY
SEED LABORATORY, 350 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116

1015

PURITY FEE _____
GERMINATION FEE _____
OTHER TZ 20.00
TOTAL FEE $ 20.00

Nov. 9, 19 92

SAMPLE SUBMITTED BY:

NAME Energy West Mining Guy Davis ADDRESS Box 1005 Huntington, UT 84528

BAGS _____ POUNDS _____ CERTIFICATION NO _____

KIND AND VARIETY *	LOT NO.	PURE SEED %	OTHER CROP %	INERT MATTER %	WEED SEED %	Germination %	HARD** SEED %	Germ & Hard Seed%	GRADE
Mat Saltbush						44.00	viable by TZ		

PURE SEED INCLUDES ALL SEED OF THE KIND BEING EXAMINED. CROP SEED CONTAINS SEEDS OF OTHER CULTIVATED PLANTS. INERT MATERIAL INCLUDES BROKEN SEED, DIRT, STICKS, CHAFF, CHALCID-FLY INFESTED SEED, AND SIMILAR MATERIAL.

*VARIETY DESIGNATIONS NOT CONFIRMED BY LABORATORY.

**RE: HARD SEEDS: ACTUAL PERCENT OF HARD SEED AND THE ACTUAL PERCENT OF GERMINATION MUST BE LISTED. IT IS NOT PERMISSIBLE TO COMBINE THESE PERCENTAGES UNDER GERMINATION.

FOREIGN SEED INCLUDES THE FOLLOWING

NOXIOUS WEED SEEDS	NO. PER POUND	OTHER WEED SEEDS	NO. PER POUND	OTHER CROP SEEDS	NO. PER POUND

REMARKS:

APPENDIX XVI
ADDED 3/26/93

TEST: CARL BOTT

DATE SAMPLE RECEIVED BY LABORATORY
10-28-92

SAMPLE TREATED
YES ☐ NO ☒

Terry Sue Freeman TSF
STATE SEED ANALYST

76

THIS SEED TEST REPORT APPLIES ONLY TO THE SAMPLES SUBMITTED. SAMPLES SHOULD BE REPRESENTATIVE OF THE LOTS FROM WHICH THEY ARE TAKEN. THE SEED LABORATORY DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE SAMPLING, UNLESS THE SAMPLE IS TAKEN BY AN AUTHORIZED EMPLOYEE OF THE UTAH STATE DEPARTMENT OF AGRICULTURE. IN REFERRING TO SAMPLES PLEASE GIVE LABORATORY TEST NUMBER.

SEED ANALYSIS REPORT
UTAH STATE DEPARTMENT OF AGRICULTURE

DIVISION OF PLANT INDUSTRY
SEED LABORATORY, 350 NORTH REDWOOD ROAD
SALT LAKE CITY, UTAH 84116

1816

PURITY FEE _____
GERMINATION FEE _____
OTHER 20.00
TOTAL FEE $ 20.00

Nov. 9, 19 92

SAMPLE SUBMITTED BY:

NAME Energy West Mining Gay Davis ADDRESS Box 1005 Huntington,UT 84528

BAGS _____ POUNDS _____ CERTIFICATION NO _____

KIND AND VARIETY *	LOT NO.	PURE SEED %	OTHER CROP %	INERT MATTER %	WEED SEED %	Germination %	HARD** SEED %	Germ & Hard Seed%	GRADE
Shadescale						29.00 viable by TZ			

PURE SEED INCLUDES ALL SEED OF THE KIND BEING EXAMINED. CROP SEED CONTAINS SEEDS OF OTHER CULTIVATED PLANTS. INERT MATERIAL INCLUDES BROKEN SEED, DIRT, STICKS, CHAFF, CHALCID-FLY INFESTED SEED, AND SIMILAR MATERIAL.

*VARIETY DESIGNATIONS NOT CONFIRMED BY LABORATORY.

**RE: HARD SEEDS: ACTUAL PERCENT OF HARD SEED AND THE ACTUAL PERCENT OF GERMINATION MUST BE LISTED. IT IS NOT PERMISSIBLE TO COMBINE THESE PERCENTAGES UNDER GERMINATION.

FOREIGN SEED INCLUDES THE FOLLOWING

NOXIOUS WEED SEEDS	NO. PER POUND	OTHER WEED SEEDS	NO. PER POUND	OTHER CROP SEEDS	NO. PER POUND

INCORPORATED
EFFECTIVE:
DEC 28 1993
UTAH DIVISION OIL, GAS AND MINING

REMARKS:

APPENDIX XVI
ADDED 3/26/93

TEST: CARL BOTT

DATE SAMPLE RECEIVED BY LABORATORY
10-28-92

SAMPLE TREATED
YES ☐ NO ☒

Terry Sue Freeman
STATE SEED ANALYST

77

THIS SEED TEST REPORT APPLIES ONLY TO THE SAMPLES SUBMITTED. SAMPLES SHOULD BE REPRESENTATIVE OF THE LOTS FROM WHICH THEY ARE TAKEN. THE SEED LABORATORY DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE SAMPLING, UNLESS THE SAMPLE IS TAKEN BY AN AUTHORIZED EMPLOYEE OF THE UTAH STATE DEPARTMENT OF AGRICULTURE. IN REFERRING TO SAMPLES PLEASE GIVE LABORATORY TEST NUMBER.

NATIVE SEED SOURCE

LOCATION - Near the Des-Bee-Dove Test Plot Area, Emery County, UT

All seed used for the Native Seedmix were collected within a 1/4 mile radius of the test plot location.

ELEVATION - Between 6750 to 7150 feet.

All collected areas were within 200 feet elevation of the test plot elevation or 6950 feet.

NURSERY SEED SOURCE

Stevenson Intermountain Seed

Box 8
Ephraim, Utah 84627
(801) 283-4535

Variety/Species	% Pure Seed	% Germ	% Dorm	% Germ & Dorm	Origin	Test Date
Rosana Western Wheatgrass	11.44	91			ID	9/92
Magnar Great Basin Wildrye	11.42	91			WA	3/92
Fourwing Saltbrush	10.35	51TZ			UT	2/92
Mat Saltbrush	10.01	39CT			UT	8/92
Winterfat	9.81	46TZ			UT	2/92
Indian Ricegrass	8.73	95TZ			WA	3/92
Critana Thickspike	8.72	93			ID	4/92
Yellow Sweetclover	5.72	92			CAN	7/92
Shadscale	5.46	49CT			UT	2/92
Appar Lewis Flax	3.13	86			CO	12/9
Kochia Prostrata	2.64	63TZ			UT	2/92
Gooseberryleaf Globemallow	1.58	85TZ			UT	8/92
Alkali Sackaton	.78	80			NM	1/92

% Inert 10.00 % Crop .09 % Weed .12 % Nox. Weed none
Net Wt. 3.97# Seed Mixture Lot No. M-92-513 Customer Order No. JS330781

GUARANTEED: Stevenson Intermountain Seed guarantees the seed to be of processed quality and true to name as specified, within recognized tolerances, but expresses or implies no further guarantees. Liability shall be limited to replacement or refund of purchase price.

2.525 PLS lbs.

DES-BEE-DOVE Test Plot
Soil Sample #1

Client : Energy West Mining Co.
Address : P.O. Box 310
Huntington, UT
Attn : Guy Davis, cc:J. Demzak
Project : JS330660
Sample Matrix: Soil
Sample ID: Soil Sample #1
Sample Date Time: 09/30/92

Lab No. : 92-SI/01388
Date Received: 10/15/92

Parameters

Saturation %	36.	%	
pH, saturated paste	8.4	units	1
Conductivity, sat. paste	9.86	mmhos/cm	1
Calcium, soluble	16.57	meq/l	1
Magnesium, soluble	10.53	meq/l	1
Sodium, soluble	106.14	meq/l	1
Sodium Absorption Ratio	28.8		
Nitrogen, total kjeldahl	0.06	%	
Potassium, extractable	189.	mg/kg	3
Phosphorus, extractable	-1.	mg/kg	3
Boron, soluble	1.52	mg/kg	2
Selenium, soluble	0.080	mg/kg	2
Sulfur, total	0.44	%	
Neutralization Potential	10.	% as CaCO3	
Acid-Base Potent.(CaCO3)	86	Tons/1000T	
Organic Matter	1.7	%	
Sand 2.00 - .062 mm	19.	%	
Silt .062 - .002 mm	51.	%	
Clay -.002 mm	30.	%	
Texture	SiCL		

1 Saturated Paste Extraction
2 Hot Water Extraction
3 AB-DTPA Extraction

Remarks:
Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Quality Assurance Officer/SH

Frank E. Polniak, Inorganic Laboratory Supervisor for FP
AH

Client : Energy West Mining Co.
Address : P.O. Box 310
Huntington, UT
Attn. : Guy Davis, cc:J. Demzak
Project : JS330660
Sample Matrix: Soil
Sample ID: Soil Sample #2
Sample Date Time: 09/30/92

Des-Bee-Dove Test Plot
SS #2

Lab No. : 92-SI/01387
Date Received: 10/15/92

Parameters

Saturation %	40.	%	
pH, saturated paste	8.3	units	1
Conductivity, sat. paste	8.43	mmhos/cm	1
Calcium, soluble	16.77	meq/l	1
Magnesium, soluble	11.27	meq/l	1
Sodium, soluble	83.52	meq/l	1
Sodium Absorption Ratio	22.3		
Nitrogen, total kjeldahl	0.05	%	
Potassium, extractable	195.	mg/kg	3
Phosphorus, extractable	-1.	mg/kg	3
Boron, soluble	1.62	mg/kg	2
Selenium, soluble	0.035	mg/kg	2
Sulfur, total	0.42	%	
Neutralization Potential	10.	% as CaCO3	
Acid-Base Potent.(CaCO3)	87	Tons/1000T	
Organic Matter	2.	%	
Sand 2.00 - .062 mm	13.	%	
Silt .062 - .002 mm	56.	%	
Clay -.002 mm	31.	%	
Texture	SiCL		

1 Saturated Paste Extraction
2 Hot Water Extraction
3 AB-DTPA Extraction

Remarks:
Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Quality Assurance Officer/S.H.

Frank E. Polniak, Inorganic Laboratory Supervisor for FP AH

Des-Bee-Dove Test Plot
SS #3

Client : Energy West Mining Co.
Address : P.O. Box 310
Huntington, UT
Attn. : Guy Davis, cc:J. Demzak
Project : JS330660
Sample Matrix: Soil
Sample ID: Soil Sample #3
Sample Date Time: 09/30/92

Lab No. : 92-SI/01389
Date Received: 10/15/92

Parameters

Saturation %	36.	%	
pH, saturated paste	7.9	units	1
Conductivity, sat. paste	3.99	mmhos/cm	1
Calcium, soluble	18.81	meq/l	1
Magnesium, soluble	11.02	meq/l	1
Sodium, soluble	23.49	meq/l	1
Sodium Absorption Ratio	6.1		
Nitrogen, total kjeldahl	0.05	%	
Potassium, extractable	192.	mg/kg	3
Phosphorus, extractable	-1.	mg/kg	3
Boron, soluble	1.51	mg/kg	2
Selenium, soluble	0.010	mg/kg	2
Sulfur, total	0.30	%	
Neutralization Potential	10.1	% as CaCO3	
Acid-Base Potent.(CaCO3)	92	Tons/1000T	
Organic Matter	1.9	%	
Sand 2.00 - .062 mm	15.	%	
Silt .062 - .002 mm	57.	%	
Clay -.002 mm	28.	%	
Texture	SiCL		

1 Saturated Paste Extraction
2 Hot Water Extraction
3 AB-DTPA Extraction

Remarks:
Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Quality Assurance Officer S.H.

Frank E. Polniak, Inorganic Laboratory Supervisor for FP JH

APPENDIX XVI
ADDED 3/26/93

Client : Energy West Mining Co.
Address : P.O. Box 310
Huntington, UT
Attn. : Guy Davis, cc:J. Demzak
Project : JS330660
Sample Matrix: Soil
Sample ID: Soil Sample #4
Sample Date Time: 09/30/92

DES-BEE-DOVE TEST PLOT
ROCKY SOIL ADMIXTURE
FROM WRS CELL #7 RECLAMATION

Lab No. : 92-SI/01390
Date Received: 10/15/92

Parameters			
Saturation %	25.	%	
pH, saturated paste	8.5	units	1
Conductivity, sat. paste	1.49	mmhos/cm	1
Calcium, soluble	3.09	meq/l	1
Magnesium, soluble	5.35	meq/l	1
Sodium, soluble	6.70	meq/l	1
Sodium Absorption Ratio	3.3		
Nitrogen, total kjeldahl	0.01	%	
Potassium, extractable	243.	mg/kg	3
Phosphorus, extractable	-1.	mg/kg	3
Boron, soluble	0.43	mg/kg	2
Selenium, soluble	0.005	mg/kg	2
Sulfur, total	0.01	%	
Neutralization Potential	10.9	% as CaCO3	
Acid-Base Potent.(CaCO3)	109	Tons/1000T	
Organic Matter	0.8	%	
Sand 2.00 - .062 mm	74.	%	
Silt .062 - .002 mm	13.	%	
Clay -.002 mm	13.	%	
Texture	SL		

1 Saturated Paste Extraction
2 Hot Water Extraction
3 AB-DTPA Extraction

Remarks:
Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Quality Assurance Officer SH.

Frank E. Polniak, Inorganic Laboratory Supervisor for FP